

HORTICULTURAL ABSTRACTS.

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Initialled abstracts or reviews in the present number are by Mrs. R. M. Ingham of the Imperial Bureau of Plant Breeding and Genetics, Miss M. Olliver of Messrs. Chivers, Histon, Cambs., and by Miss C. P. Field, N. H. Grubb, W. A. Roach and H. Wormald of the East Malling Research Station.

INDEX OF CONTENTS.

MISCELLANEOUS	Nos. 651-695
General	651-653
Propagation	654-661
Laboratory and field technique	662-671
Growth and nutrition	672-695
TREE FRUITS, DECIDUOUS	696-737
General	696-700
Varieties	701-705
Rootstocks	706-715
Pollination	716-717
Growth and nutrition	718-720
Manuring, soils and cultural practice	721-737
SMALL FRUITS, VINES AND NUTS	738-744
PLANT PROTECTION OF DECIDUOUS FRUITS	745-779
VEGETABLE GROWING, STIMULANTS, ETC.	780-821
FLOWER GROWING	822-836
CITRUS AND SUB-TROPICALS	837-906
TROPICAL CROPS	907-965
STORAGE	966-984
PROCESSING AND PLANT PRODUCTS	985-1012
NOTES ON BOOKS AND REPORTS	1013-1054

Horticultural Abstracts

Vol. XI

September, 1941

No. 3

MISCELLANEOUS.

General.

651. RUSSELL, E. J. 575/577 : 633/635
The function of applied biology in war time.
Ann. appl. Biol., 1941, 28 : 170-7.

At the General Meeting of the Association of Applied Biologists, Sir John Russell opened the discussion on the functions of applied biology in wartime. These formed four groups: (1) biological warfare; (2) maintenance of public health; (3) protection of food supplies and other materials in field and store against deterioration; (4) increase of food supplies. The speaker dealt chiefly with (3) and (4). Recent successful work on some of the problems involved was mentioned; the main theme, however, was concerned with the numerous problems still awaiting solution, a list too long to mention here. In this war the advisory and executive activities are on a regional basis while the administrative and research services are centralized. This arrangement while possessing advantages has certain weaknesses, one being that research and advisory services may be out of touch with one another. The speaker concluded with the hope that wartime problems would not be immediately shelved as in the last war as soon as peace is restored. After a number of other members had continued the discussion it was resolved "that the Council bring to the notice of such authorities as they think desirable some of the pressing problems which exist to-day in applied biology and discuss with them the means of utilizing to the best advantage the services of applied biologists".

652. CHADWICK, D. 63 : 016
The Imperial Agricultural Bureaux.
Chem. Industr., 1941, 60 : 393-4.

Sir David Chadwick, Secretary of the Imperial Agricultural Bureaux and Institutes, describes their aims and work.

653. WEBBER, J. M. 581.141
Polyembryony.
Bot. Rev., 1940, 6 : 575-98, bibl. 116.

This paper is a review of what is known on the subject of polyembryony in plants. Knowledge has progressed slowly because except in a relatively few genera polyembryony is only occasionally observed. The following types of polyembryony are discussed:—Sporophytic polyembryony in which the embryos are derived by sporophytic budding from the nucellus or from the integument. Cleavage polyembryony accomplished by the separation of the zygote or young embryo into two or more units, each of which develops into a separate embryo. Simple polyembryony due to the characteristic formation of a plurality of eggs from a single megaspore and the union of these eggs with sperms. Euploid polyembryony, which includes multiple embryos, which give rise to monoplasts as well as euploids. Reference is also made to a group of unclassified cases. True polyembryony is described as the production of one or more embryos within an ovule. False polyembryony is the production of plural embryos derived from several embryo sacs, but the distinction is a purely arbitrary separation and a more natural or physiological distinction would be more appropriate. The advantages and disadvantages of polyembryony to agriculture are, in conclusion, discussed with special reference to citrus.

Propagation.

654. JOHN INNES. 631.53 + 631.462
John Innes composts and soil sterilisation for pot plants.
John Innes Leaflet. 1 & 2 (2nd edit.) 1941, pp. 8, ? 6d.
The John Innes soil steriliser. 631.462
John Innes Leaflet. 3 (2nd edit.) 1941, pp. 7, 6d.

These leaflets which are of great practical value can be obtained from the Institution at 31 Mostyn Road, London, S.W.19.

655. RAYNER, M. C. 631.875 : 632.51
Bracken compost.
Nature, 1941, 147 : 641.

The value of bracken as a source of compost is described. The most successful source of added nitrogen was commercial dried blood. The addition of ammonium sulphate or ammonium phosphate in place of the dried blood gave inferior results. The heaps develop a high temperature and decompose easily into a sweet smelling friable compost. It is specially recommended for trees. Its value for other crops has yet to be tested.

656. HOLMES, E. 577.15.04
Recent work on the application of plant hormones to seeds.
Agriculture, Lond., 1941, 48 : 51-4, bibl. 15.

Recent work by various investigators is briefly summarized and from it the conclusion is drawn that the case for the treatment of agricultural seeds with plant hormones is not proved.

657. WINKLEPLECK, R. L., AND MCCLINTOCK, J. A. 577.15.04
Lanolin emulsions as carriers of growth substances.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 94-6.

A formula producing an emulsion which will remain stable at room temperatures requires :—Lanolin 38 g., stearic acid 7.5 g., triethanolamine 2.7 g., water 100 g. The triethanolamine, stearic acid and water were heated together till the stearic acid was melted. The mixture was stirred to a creamy soap solution and the lanolin was added. The heating was continued without stirring till the lanolin was completely melted. The mixture held just below 212° F. was then stirred vigorously until a thick, creamy, uniform emulsion was formed. The emulsion was allowed to cool in a water bath with frequent stirring. By adding more water either before or after preparation the emulsion can be given any desired consistency. The crystals of the growth substance should be dissolved in a minimum amount of dioxane or other suitable solvent and then added with constant stirring to the emulsion. The preparation can then be satisfactorily applied with a small brush.

658. GRACE, N. H. 577.15.04
Effects of potassium acid phosphate, cane sugar, ethyl mercuric bromide, and indolylacetic acid in a tale carrier on the rooting of stem cuttings.
Canad. J. Res., 1941, 19, Sec. C, pp. 99-105, bibl. 11.

Potassium acid phosphate had some significant effects on the rooting of greenwood cuttings of *Deutzia*, *Symphoricarpos*, and *Weigela*, both when considered alone and in combination with other chemical factors. Dormant plants of *Lonicera tatarica* were also favourably influenced, but appeared less sensitive to overdoses than the green material.

659. TEMPLEMAN, W. G., AND MARMOY, C. J. 577.15.04
The effect upon the growth of plants of watering with solutions of plant-growth substances and of seed dressings containing these materials.
Ann. appl. Biol., 1940, 27 : 453-71, bibl. 15.

The plants concerned were lettuce, mustard, tomato, sugar beet and various cereals.

660. WOLCOTT, G. B. 547.944.6 : 577.15.04 : 584.2
The effect of colchicine on a hepatic.
J. Hered., 1941, 32 : 67-70, bibl.

The observations described indicate that the action of colchicine on the cells of the liverwort, *Pallavicinia lyellii*, is similar to that in the higher plants.

661. CLARK, N. A., AND FRAHM, E. E. 577.15.04
Influence of auxins on reproduction of *Lemna major*.
Plant Physiol., 1940, 15 : 735-41, bibl. 16.
 GRACE, N. H. 577.15.04
Physiological activity of a series of indolyl acids.
Canad. J. Res., 1939, 17, Sec. C, pp. 374-5, bibl. 5.

Laboratory and field technique.

662. FRIEND, W. H. 581.111
A simple method of making tree injections.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 203-4, bibl. 4.

This method of tree injection with liquids might be called the "fountain syringe" method except for the fact that large bore garden hose about 3 ft. long is substituted for the conventional type of fountain syringe. The auger bits should be slightly smaller than the outside diameter of the hose. The 3-foot lengths can be tied to branches so that the free end is 2 feet or more above the point of insertion. The number and depth of holes depend on circumstances.

663. COMMITTEE ON APPARATUS IN AEROBIOLOGY, NATIONAL RESEARCH COUNCIL, U.S.A. 578.087
Techniques for appraising air-borne populations of micro-organisms, pollen and insects.
Phytopathology, 1941, 31 : 201-25, bibl. 97.

The paper brings to the attention of investigators techniques dating from 1857 to the present time in population estimations of airborne micro-organisms, etc., consideration being given principally to methods of catching and counting air-borne material.

664. GRAY, P. H. H. 578.65
A solution for staining differentially the spores and vegetative cells of micro-organisms.
Canad. J. Res., 1941, 19, Sec. C, pp. 95-8.

The solution referred to in the title is a mixture of two phenyl methane dyes, malachite green and basic fuchsin ; it can be used as a concentrated aqueous solution or as a dilute saline solution. The article describes fully the methods employed and the results to be expected.

665. EATON, F. M. 663.61 : 581.084.1
Plant culture equipment.
Plant Physiol., 1941, 16 : 385-92, bibl. 3.

A detailed and illustrated description is given of a small sand and water culture equipment. Some modifications in the construction of large outdoor sand culture equipment for tree and annual crops are discussed.

666. BROYER, T. C., AND FURNSTAL, A. H. 581.11
A press for recovery of fluids from plant tissues.
Plant Physiol., 1941, 16 : 419-21, bibl. 2.

A description and detailed reproduction of the design of a press for the expression of plant tissue fluids are given. The dimensions are suitable for a press to contain about 25 grams of tissue.

667. PLITT, T. M. 578.6
Seed impressions on plastic films.
Plant Physiol., 1941, 16 : 422-4, bibl. 1.

A method is described whereby impressions may be obtained in a few minutes, if necessary in quantity, on plastic film of the hard surfaces of seeds on other parts of fruits. The method is useful in taxonomic studies, identifications, etc., since it enables characters to be easily examined which are difficult to observe directly under the microscope.

668. WEBB, L. W., JR., AND FERGUSON, F. F. 535.33 : 581.144.1
Comparative transmission spectrograms of different concentrations of leaf extract.
Plant Physiol., 1941, 16 : 425-7, bibl. 1.

This study continues the work on the physical properties of leaf extracts and is a preliminary effort to show the effects of increased dilution of an alcoholic solution of green leaf.

669. FLEMION, F. 631.531
Further studies on the rapid determination of the germinative capacity of seeds.
Contr. Boyce Thompson Inst., 1941, 11 : 455-64, bibl. 15.

Studies on the method of testing the viability of dormant seeds by excision of the embryo and the observation of its behaviour on moist filter paper at 21-23° C. have been continued. The only difficulties encountered are in connexion with the excision of the embryos. Such pre-treatments as acid treatment, cracking of outer coats, short period in moist peat moss, partial after-ripening of the embryos, etc., will usually overcome this difficulty in any particular seed.

670. HAAS, A. R. C. 581.11 : 631.415
pH determination in plant tissue.
Plant Physiol., 1941, 16 : 405-9, bibl. 1.

The method used for the pH determination in soils of low moisture content was found equally applicable to plant tissue. A feature of the method was the use of a horn spoon in spreading the moisture from the cut cells uniformly over the greater mass of cells which remain unopened even when plant tissue is finely cut in a grinder. There was good agreement between results obtained in this manner and those obtained with juice extracted from frozen tissue. Over a wide range of pH in the soil of avocado cultures no significant change in the pH of the leaf was noted.

671. BURKHART, L. 581.192 : 546.32
Potassium determination by the cobaltinitrite method as affected by temperature and pH.
Plant Physiol., 1941, 16 : 411-4, bibl. 3.

It is shown that the precipitating medium should be maintained at 10° C. and pH 6 for the rapid determination of potassium by the cobaltinitrite method. Potassium standards should be prepared in the buffer systems at the same pH as the extracts being examined. Under these controlled conditions of temperature and pH, a readable concentration range of 2-200 p.p.m. of potassium is attained. Turbidity measurements are satisfactorily made by the photoelectric method when using the proper colour filter.

Growth and nutrition.

672. TEMPLEMAN, W. G. 663.61 : 581.084.1
Culture of plants in sand and in solutions.
Bull. Jealott's Hill Res. Stat. 2, 1941, pp. 28, bibl. 19.

A popular though precise account is presented of the results and conclusions reached through carefully controlled experiments with the cultivation of plants in sand and in solutions during the past 3 years at Jealott's Hill. Sand culture has proved much more satisfactory than water culture, yielding excellent crops of tomato and of a number of vegetables and flowers. This bulletin is just what is required by those who want to obtain results without going too deeply into first causes. The full data will be published in due course in scientific journals.

673. PILLAI, S. C. 663.61 : 581.084.1
A new aspect of hydroponics : "hanging gardens" in the activated sludge tank.
Curr. Sci., 1941, 10 : 85, bibl. 6.

A short note on investigations into the possibility of growing various food and flower plants in the activated sludge tank at the Indian Institute of Science, Bangalore. Successful growth of rice, ragi, tomatoes, chillies, roses, tuberoses and marigold was effected in "hanging gardens", i.e. boxes or trays hung with proper support in the aeration chambers of the sludge tank so that

the tank liquid reaches only to the top of the pebbles or the bottom layer of the fibrous material. The plants showed very luxuriant growth and were almost giant specimens. Tillering and ear bearing in rice and ragi were phenomenal.

674. DOUGHTY, J. L. 581.144.2

The rate of decomposition of plant roots.

Sci. Agric., 1941, 21 : 429-32, bibl. 3.

The rate of decomposition of coarse or fine sections of alfalfa, a sedge and some grasses mixed with soil and kept in porous clay pots in a greenhouse was related to the C/N ratio, being more rapid in material with the narrower ratio.

675. MASON, T. G., AND PHILLIS, E. 581.11

Some comments on the mechanism of phloem transport.

Plant Physiol., 1941, 16 : 399-404, bibl. 22.

A criticism of a paper by Crafts* in which he holds that the mechanism of phloem transport is a case of mass flow of solution through sieve-tubes or phloem, related, at least indirectly, to activity of photosynthetic tissues and not dependent upon the activity of the sieve-tube protoplasm, as against the theory of movement of solute molecules taking place in, through, or upon the surface of sieve-tube protoplasm, as the result of protoplasmic activity.

676. McDERMOTT, J. J. 635.977.2.771 : 581.192

Changes in chemical composition of twigs and buds of yellow poplar (tulip tree) during the dormant period.

Plant Physiol., 1941, 16 : 415-8, bibl. 5.

Some of the chemical changes occurring in the buds and one-year-old twigs of *Liriodendron tulipifera*, the tulip tree, during winter and on breaking dormancy are reported. There was an apparent decrease in total nitrogen. During February and early March much of the protein was converted into more soluble compounds which were resynthesized into insoluble forms, probably proteins, for the production of new protoplasm in the expanding buds.

All of the carbohydrates appear to be used in respiration, starch and the sugars most readily, and the hemicelluloses least readily, if at all. With the resumption of photosynthetic activity starch appears, and the hemicelluloses are synthesized again. [From author's summary.]

677. MILLER, L. P. 577.15.04 : 635.64

Induced formation of a β -gentiobioside in tomato roots.

Contr. Boyce Thompson Inst., 1941, 11 : 387-91, bibl. 9.

Gentiobiose has not previously been known to occur in tomato plants. The experiments show that when tomato plants (Marglobe) are grown in sand cultures to which o-chlorophenol has been added, a β -o-chlorophenyl glycoside is formed in the roots. This has been shown to be β -o-chlorophenyl-gentiobioside through the preparation of the acetyl and propionyl derivatives which were found to be identical with the corresponding synthetic compounds. [From author's summary.]

678. LANGHAM, D. G. 612.014.44

Effect of light on growth habit of plants.

Science, 1941, 93 : 576-7.

Experiments were conducted at the Instituto Experimental de Agricultura, Caracas, Venezuela, on the effect of light and darkness on a number of plants which normally have a prostrate habit, including *Commelina cayennensis*, *Portulaca oleracea*, *Mimosa sensitiva*. Several plants of each, on being covered for a few days with a low roof of burlap bags or cardboard boxes, started to raise themselves and gradually became erect. On removal of the covering they became prostrate again. These and other experiments with cuttings lead the author to suppose that certain plants of a normal prostrate growth habit in the field are probably negatively phototropic to intense light. A publication on the experiments is promised.

* Crafts, A. S. Translocation in plants. *Plant Physiol.*, 1938, 13 : 791-814.

679. WITHROW, R. B. 612.014.44

Response of seedlings to various wavebands of low intensity irradiation.

Plant Physiol., 1941, 16 : 241-56, bibl. 6, being *Contr. Hull. bot. Lab.* 523.

The data presented indicate with red kidney bean and a number of other young plants that in the absence of radiant energy the major portion of the reserve material translocated from the cotyledons remained in those parts of the plant immediately adjacent to the cotyledonary node, i.e. the hypocotyl and first internode. The longer wavelengths of the visible spectrum increased the total amount of reserves translocated from the cotyledons and also greatly increased the proportion translocated beyond the hypocotyl and first internode, that is to the epicotyl above the first internode and to the roots, with acceleration appreciably greater towards the apical portions of the stem. It is concluded that the process is not directly related to chlorophyll synthesis, since a minimum morphological response was produced by the blue region with a strong development of chlorophyll and almost a maximum morphological response occurred in the far red where only a trace of chlorophyll appeared. [From author's summary.]

680. SMITH, J. H. C., AND COWIE, D. B. 633.85-1.811.92

Absorption and utilization of radioactive carbon dioxide by sunflower leaves.

Plant Physiol., 1941, 16 : 257-71, bibl. 9.

Absorption of carbon dioxide by living sunflower leaves when analysed by the aid of radioactive carbon dioxide, i.e. carbon dioxide to which a sample of radioactive carbon dioxide has been added for indicator purposes, has shown that three possible methods of absorption are all operative, namely, solution in the water of the sap, reaction with soluble buffer substances, and reaction with insoluble carbonates, presumably calcium carbonate. In addition carbon dioxide reacts to form a non-carbonate derivative of which little is known. The photosynthetic process can utilize carbon dioxide which has been stored in the leaf previous to illumination. Thus the absorption of carbon dioxide for photosynthetic purposes is not a part of the photochemical reaction. The carbon newly assimilated in photosynthesis can be rapidly lost in respiration, though whether at a greater or less rate than that of carbon from other organic compounds contained in the leaves, such as glucose, was not determined.

681. POPP, H. W. 535.21 : 631.531

Effects of ultraviolet radiation upon germination and seedling development.

Bull. Pa agric. Exp. Stat. 366, 1938, pp. 50.

CHINYO, J. J. 581.192

A new micro-iodine method for the determination of starch in plant material.

Indian J. agric. Sci., 1941, 11 : 95-9, bibl. 6.

BADENHUIZEN, N. P. 577.15.04 : 547.944.6

Colechicine induced tetraploids obtained from plants of economic value.

Nature, 1941, 147 : 577.

682. MOORE, L. B. 631.873 : 581.192

The economic importance of seaweeds.

Bull. N.Z. Dep. sci. industr. Res. 85, 1941, pp. 40, bibl. 31, 2s. 6d.

Information is given on composition, harvesting, processing, and cultivation of seaweeds in various parts of the world, with special reference to New Zealand. The various uses to which seaweed can be put are discussed at greater length. The bulletin concludes with an illustrated description of the New Zealand seaweeds of potential economic importance and a key to the New Zealand brown algae.

683. UYS, C. J. 634.973.623

The weeping willow as fodder tree.

Fmg S. Afr., 1941, 16 : 97-9.

The value of the leaves and shoots of the weeping willow (*Salix babylonica*) as a food for cattle is pointed out. Owing to its deep root system the foliage is fresh when other herbage is dried up. Instructions are given for growing and disposing of the willow to best advantage on South African farms.

684. VAN DER KLOOT, W. G. 581.057 : 631.8
 De biologisch-dynamische landbouwmethode. (**The biological-dynamic method of plant nutrition.**) [German summary.]
 Reprinted from *Landbouwk. Tijdsch.* 50, 1938, pp. 44, bibl. 66.

A report is given of 4 years' experiments at the Horticultural Laboratory, Wageningen, on the use of the biological-dynamic methods of plant nutrition. Four different manurial treatments were tested, namely compost, compost and lime, biological-dynamic manure (prescription of the agriculturists of the Rudolf Steiner School), and artificial fertilizers, all containing the same amounts of N, P, K and CaO. Crop returns with various plants, e.g. strawberries, potatoes, tomatoes, etc., showed no important differences either qualitative or quantitative as the result of any particular treatment. In addition Pfeiffer's crystallization experiments were carried out in the laboratory. Plant extracts in very dilute solutions were added to a copper chloride solution and crystallization allowed to proceed in shallow glass dishes. According to Pfeiffer the crystallization pictures show typical differences according to the kind of sap used, the differences being attributed to the effectiveness of the so-called shape strengths (Formkräfte). Despite numerous accurate trials it was not possible to produce any typical and permanent differences in the crystallization picture as the result of using different plant juices. [Author's summary.]

685. MCCOOL, M. M. 631.84
Comparison of agronomic value of the insoluble nitrogen derived from urea-ammonia liquor-37 and other sources.
Contr. Boyce Thompson Inst., 1941, 11 : 393-401, bibl. 2.

Insoluble synthetic nitrogen formed from urea-ammonia liquor-37 under proper conditions, which are described, gave slightly lower yields with millet on sandy loam than when added in the form of cottonseed meal but higher than when in the form of tankage. When added to Gloucester loam it was of equal efficiency with cottonseed meal on corn and tomatoes and millet. Insoluble nitrogen in cocoa shell meal was of practically no value in promoting growth. Storage of UAL-37 base for 8 weeks at 110° F. or 2 weeks at 160° F. did not affect its availability. The carry-over effect to the succeeding crop was more than twice that of cottonseed meal. In rate of nitrification UAL-37 base and cottonseed meal were more active than process tankage and mixed fertilizers. The importance of ammoniation of the superphosphate and the formation of the insoluble nitrogen at a proper reaction were demonstrated both by growth and nitrification studies.

686. BEESON, K. C. 581.192 : 631.4
The mineral composition of crops with particular reference to the soils in which they were grown.
Misc. Publ. U.S. Dep. Agric. 369, 1941, pp. 164, bibl. 607+23.

Attention is called to the extensive bibliography on the mineral composition of crops, most of the references being to recent work.

687. DAVIES, G. N. 546.47 : 631.453
An investigation of the effect of zinc sulphate on plants.
Ann. appl. Biol., 1941, 28 : 81-4, bibl. 6.

Ten plants of dwarf french beans were grown in culture solutions containing each of the following concentrations of zinc sulphate : 200, 100, 50, 5 and 1 p.p.m., and were compared with a control series containing no zinc. There was some difficulty in keeping the zinc concentration constant, since phosphate introduced in any form affected it, but the data obtained were sufficient to show that zinc sulphate is definitely toxic to plants. Its presence on the dumps of disused lead mines in Cardiganshire therefore would account for the failure of attempts to establish vegetation on these dumps (for a purpose which is described). Any phosphate in the soil would combine with the zinc and be unavailable for plant growth. It is suggested that liberal phosphate dressings on the dumps might precipitate the zinc while leaving enough phosphate to encourage plant growth.

688. ATKINSON, H. J. 581.192 : 631.416.1
Invertase in plants as a measure of available soil nitrogen.
Sci. Agric., 1941, 21 : 508-14, bibl. 7.

The effect of N, P and K on the invertase activity of rye seedlings is studied.

689. SOIL SCIENCE. 631.415
Present concepts of ion availability in plant nutrition.
Soil Sci., 1941, Vol. 51, No. 6, containing pp. 429-500.

This number is devoted entirely to the 5 papers which follow :—Hoagland, D. R., and Arnon, D. I.—Physiological aspects of availability of nutrients for plant growth. Shive, J. W.—The balance of ions and oxygen tension in nutrient substrates for plants. Magistad, O. C.—Ion and plant relationships in western arid soils. Peech, M.—Availability of ions in light sandy soils as affected by soil reaction. Albrecht, W. A.—Soil organic matter and ion availability for plants. The papers are usefully indexed.

690. PAPADAKIS, J. S. 631.432
A rapid method for determining soil moisture.
Soil Sci., 1941, 51 : 279-81.

The apparatus necessary are flasks and balances, preferably automatic, weighing about 200 g. to an accuracy of 0.1 g. The procedure is as follows :—Place 50 g. soil in a flask bearing a volume mark at about 100 c.c. Add tap water, shaking to eliminate soil air. Make up to the volume and weigh. Subtract from this weight that of the flask made up to the same volume with water only. The difference multiplied by a factor gives the oven-dry weight of the soil. The factor is determined for each kind of soil by oven-drying a sample and dividing the oven-dry weight by the aforementioned difference. The method can also be used for plant materials.

691. ALLYN, R. B., AND WORK, R. A. 631.432
The avallameter and its use in soil moisture control. I. The instrument and its use.
Soil Sci., 1941, 51 : 307-22, bibl. 24.

A description is given with diagrams of the soil moisture availability meter or avallameter, as used on pear soils at the Medford branch of the Oregon Agricultural Experiment Station. It measures the plasticity or stability of a soil core obtained with the soil tube. A close relationship is found to exist between this measurement and the corresponding moisture content. A simple method of determining the available soil moisture range and soil moisture available for plant use at any time is also given. Its use would appear to be limited to soils giving cohesive soil tube cores, i.e. medium or heavy type soils.

692. SUDDS, R. H. 634.1/7-1.432
Infiltration and our orchard soils.
 Reprinted from *Yearb. W. Va hort. Soc.* 1941, pp. 6.

The importance is stressed of protecting the orchard soil surface with adequate vegetation or ample organic mulch in order to conserve soil moisture especially in the drier districts. Orchards under sod have automatically maintained favourable soil conditions suitable to the rapid infiltration of moisture without loss of soil, in marked contrast to conditions existing in cultivated orchards.

693. FOGLIA, A. E. 631.67
 Aprovechamiento de las aguas subterráneas para riego—proyecto de una pequeña instalacion. (**Employment of subterranean water for irrigation. A simple installation.**)

Mem. anu. Inst. Mec. Hidraul. agric. Buenos Aires 1938, 1939, pp. 62-71.

Various simple plants for pumping up subterranean water for irrigation purposes are described and illustrated.

694. LANE, M. C. 632.765 : 631.67
Wireworms and their control on irrigated lands.
Fmrs' Bull. Dep. Agric. U.S. 1866, 1941, pp. 21.

The methods of control dealt with are trapping and baiting, the use of carbon disulphide, crude naphthalene, flooding in hot weather when the soil temperature does not fall below 70° F. at a

depth of 6 inches, drying the soil once every 5 or 6 years, summer ploughing to kill pupae, rotation of crops. The time of planting various susceptible crops to avoid damage is also briefly discussed.

695. WILCOX, J. C. 631.432
Soil moisture studies. I. Some factors affecting the moisture holding capacity and its determination.
Sci. Agric., 1939, 20 : 140-9, bibl. 32.
 WILCOX, J. C., AND SPILSBURY, R. H.
II. Some relationships between moisture measurements and mechanical analysis.
Sci. Agric., 1940, 21 : 459-472, bibl. 8.
 WILCOX, J. C., AND SPILSBURY, R. H.
III. An application of soil moisture measurements to soils classification.
Sci. Agric., 1940, 21 : 473-8, bibl. 4.
 STAPLE, W. J., AND LEHANE, J. J. 631.432
The use of the wilting coefficient in soil moisture studies in southwestern Saskatchewan.
Sci. Agric., 1941, 21 : 440-7, bibl. 9.
 CHEPIL, W. S., AND MILNE, R. A. 631.459
Wind erosion soils in relation to size and nature of the exposed area.
Sci. Agric., 1941, 21 : 479-87, bibl. 4.
 CHEPIL, W. S. 631.459
Relation of wind erosion to the dry aggregate structure of a soil.
Sci. Agric., 1941, 21 : 488-507, bibl. 15.
 KRAMER, P. J., AND COILE, T. S. 581.144.2 : 631.432
An estimation of the volume of water made available by root extension.
Plant Physiol., 1940, 15 : 743-7, bibl. 10.

TREE FRUITS, DECIDUOUS.

General.

696. MOTZ, F. A. 634.1/8 : 658.8
The world outlook in relation to the fruit industry.
Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 85-91.
 A most interesting account of the expansion and shrinkage of world markets for fruit from deciduous and citrus orchards in the last 20 years. It is thought that the restrictive controls operating on the European markets before the war, which have now become much stronger, are bound to continue for some time after peace has been declared. Alleviation of producers' difficulties may lie in elimination of marginal produce, of the setting of very high standards for fruit and in the development of by-products. It is noted that Germany hopes to get enough fruit produced in the Balkan countries, despite the rather primitive state of their agriculture, to offset the cutting off of supplies from overseas.
697. PARROTT, P. J. 634.1/7
The research program of the Geneva Experiment Station.
Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 248-60.
 Of apples bred by the Station Cortland receives special mention, as also Early McIntosh, Lodi, Orleans, Macoun and Sweet Delicious. Of plums Stanley shows promise for productiveness and quality. New cherries produced include Seneca, Gil Peck and Sodus. Some 25 new varieties of grape have been introduced, some already having shown commercial merit. Of red raspberries Taylor, Marcy and Newburgh are among the best of the Station's productions. Among purple raspberries Sodus and Marion should be noted. Bristol is perhaps foremost among the new black raspberries. Several new strawberries are coming to the fore, e.g. Catskill, Clermont, Culver and Dresden. Plant disease control has been directed largely to apples, cherries, peaches, gooseberries and raspberries. Pest control has centred round the following

problems :—insecticide testing ; life history and seasonal development of pests ; development of new insecticides ; biological control ; non-chemical control measures. The chemists are examining the possibilities of synthetic organic compounds, extracts of plants containing toxic principles, petroleum and coal tar as possible sources of insecticides and fungicides. Fruit by-products are being studied. Attention is being paid to methods of processing apple juice and the development of new fruit juice blends such as cherry cocktail, apple-raspberry juice and a new type of prune juice.

698. PRETORIUS, W. J., AND PRINSLOO, A. L. 634.1/8
An economic investigation into certain aspects of the fruit industry in the Western Cape Province 1936-37.

Fruit Invest. Rep. Dep. Agric. S. Afr. 1, 1938, pp. 68.*

This forms the first report on investigations into the fruit industry of the Western Cape Province of which a second report was issued in 1939, *see H.A.*, 11 : 33. This first report is concerned chiefly with the four main export localities, viz. Elgin, Ceres, Constantia and De Doorns. While pointing out that lack of co-operative organization is a prominent feature of the deciduous fruit industry the authors do not, as in the second report, make any specific recommendations.

699. SOUTH AFRICA, UNION OF. 634.1/7 : 382.6
Fruit production in the Union. Report No. 25. The 1938-39 deciduous fruit export season.

Bull. Dep. Agric. S. Afr. 211 (Horticultural Series 3), 1940, pp. 160, 1s.

Much information is given in connexion with export conditions, states of maturity for picking, condition on arrival overseas of various deciduous fruits. The report deals in detail with the effect of ethylene gas treatment in the ripening of Cape plums especially Kelsey, Wickson and Gaviote. Reports from England show that treated plums have usually arrived highly coloured and in excellent flavour and condition whereas untreated have been green and unsaleable. On the other hand there have been some failures, treated fruit being found overripe and bladdery, on arrival. Further study of the treatment in regard to these plums should if successful, as is likely, make a very big difference to their commercial future in the export market.

700. SHEAR, S. W. 634.1/8 : 31
Deciduous fruit statistics as of January 1941.

Contr. Giannini Foundation† agric. Econ., mim. Rep. 76, 1941, pp. 104.

The data cover for the most part 15 or 20 crop years and deal largely with production, yields, utilization, consumption, shipments, exports, imports and prices of deciduous fruits with special reference to California and U.S.A. ; some data on citrus and dates are included.

Varieties.

701. BLAIR, D. S. 634.11
Sampling and testing apple varieties for Quebec orchards.

47th A.R. Quebec pomol. Fruitgr. Soc. 1940, pp. 31-4.

Brief accounts of the following apples which are recommended for planting in Quebec orchards in preference to the overplanted McIntosh. (1) Early maturing varieties :—Crimson Beauty, Early McIntosh, Joyce, Atlas, Milton, Hume and Lobo. (2) Winter varieties :—Cortland, Macoun, Lawfam, Linda, Sandow, Donald and Bancroft.

702. GRÜNBERG, I. P. 634.13
La pera Williams de Rio Negro y sus problemas. (The Williams pear and its problems on the Rio Negro.)

Jornadas agron. vet. Buenos Aires, 1939, 1940, pp. 189-236, bibl. 27.

The paper discusses (1) factors which influence the successful cold storage of pears on the Rio Negro, Argentine ; (2) other problems connected with marketing, drying and topworking surplus trees. The data for (1) were obtained from observations at two large commercial cold

* Received 1941.

† Agricultural Experiment Station, Berkeley, Calif.

stores. Pears picked January 23rd and 24th and placed in cold storage on 27th kept for about 3 months, while those picked on February 6th and 8th and stored on the 9th and 11th kept only one month. Large fruit picked early kept better than small. The reverse was the case with the late harvest. In one establishment the first picking kept best at 4-5° C. and the second at 3-4° C., in the other the best results were obtained at 3-4° C. for the first and 5° C. for the second pickings. Fruit on free stock kept better than that on quince. Highly coloured fruit of the second picking kept twice as long as green fruit picked at the same time. (2) Most of these problems are of purely local interest. It is proposed to deal with the over-production of Williams by topworking surplus trees to other varieties and to this end the frameworking method of Garner and Walker* is described and illustrated.

703. MARANI, M., AND GERBALDI, C. 634.25
Sei varietà di pesco raccomandabili. (Six recommended peach varieties.)
Riv. Frutticoltura, 1940, 4 : 113-23.

Brief descriptions and illustrations of six varieties which represent an uninterrupted fruiting capacity during the period July 6th-August 12th in the Romagna district of Northern Italy. They are Lacroix 3, Arkansas, Madame Kira Evreinoff, Charles Ingouf, Guilloux No. 1 and Guilloux No. 2. R.M.I.

704. COSMO, I. 634.25 : 575.252
Tre casi di probabile mutazione gemmaria osservati su piante di pesco.
(Three cases of probable bud mutation in the peach.)
Riv. Frutticoltura, 1940, 4 : 125-34, bibl. 8.

The probable bud mutations concerned the fruits and are described in two cases. Attempts to propagate failed. R.M.I.

705. LAMMERTS, W. E. 634.21
A Royal apricot sport of short chilling requirement : origin and transmission of characteristics to seedlings.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 175-8.

An account of a sport from the apricot variety Royal which has low winter chilling requirements and transmits this quality to its offspring. It offers great promise if it is found possible to separate this character from its poor fruiting habit and poor fruit quality.

Rootstocks.

706. TUKEY, H. B. 631.541.11 : 634.1/2
The problem of better rootstocks for fruit trees.
Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 297-304.

Rootstocks now in common use are for apple, seedlings of French crab *Malus domestica*; for pear, seedlings of French pear *Pyrus communis*, and to a lesser degree of the oriental pears *P. ussuriensis*, *P. calleryana* and *P. serotina*; for cherry, seedlings of mazzard (*Prunus avium*) and mahaleb (*P. mahaleb*); for plum, seedlings of myrobalan (or cherry plum) (*Prunus cerasifera*) and a few vegetatively produced stocks of marianna; for peaches, "naturals", i.e. seedlings of wild peaches (*Prunus persica*). Despite the lack of uniformity inherent in such stocks there is undoubtedly room for improvement in the seed supply by making known crosses between two varieties or lines. Maney of Iowa has thus already produced apple seedling rootstocks remarkable for uniformity and for the vigour of the trees worked on them. A nearly pure line of mazzard has been achieved. Many consider that the future lies with the seedling. Vegetatively produced rootstocks, especially for apples, have been and are being put to satisfactory tests in the U.S.A. They include not only the Malling range but also some of American origin such as Yerkes' selections. A phase of the clonal rootstock problem is that which involves clonal material as intermediate stem piece or body stock. Thus in Canada the use of Haas, Hiberna and seedlings of *Malus baccata* as intermediate tends to greater hardiness. Virginia Crab used similarly in Indiana and in Iowa has also increased hardiness. The range of size afforded by the Malling stocks is large and they have stood up to severe winters in New York

* Frameworking of fruit trees. Occasional Paper No. 5, Imperial Bureau of Horticulture, East Malling, 1938, 1s.

State. Varietal preferences for particular stocks have been shown, but so far no case of real incompatibility with these stocks has been found.

707. CANNON, H. B. 631.541.11 : 634.11 + 634.13
Studies in the variation of nursery fruit trees on vegetatively raised rootstocks.
J. Pomol., 1941, 19 : 2-33, bibl. 7.

Some variation will always be found in nursery trees even apart from that due to environment. This may be due to several factors such as differences in age, size and rooting of the rootstock, previous history of the bud or graftwood and differences in the methods of budding or grafting used. The extent of this variation in worked apple and pear trees is examined in the first part of this paper. In the second and third parts experiments designed to show how far small differences in rootstock and scion can influence the tree in the early stages of its existence are described. The work was carried on in a commercial orchard and in the experimental nurseries of the East Malling Research Station. Among the general conclusions reached are the following : Some varieties and trees worked on certain rootstocks vary more than others. All nursery trees tend to vary greatly at the beginning but to level up considerably by the end of the main growth period. The data indicate that so far as clonal rootstocks are concerned a closer grading for size or root development than is now usual in commercial practice will be of little advantage in attaining greater uniformity. In the observations recorded budded apple trees were, in general, larger and less variable than grafted apple trees. A contributory cause of this may be the fact, noted in other experiments, that clear differences can be seen in results from the use of graft wood taken from the basal as compared with that from the apical end of the shoot. In Durondeau pears both the position of the bud on the shoot and the age of the trees from which the shoots came did have some effect on the resulting tree, but in Conference no such effect was found. Of budding methods only high snagging seemed likely to influence variation, and that only if the buds were inserted in positions of different aspect (or shade). The removal or not of the wood in the bud shield appeared immaterial, as also, in grafts, the position of the top bud of the scion. In nearly every comparison the larger trees were the less variable in size.

708. TUKEY, H. B., AND BRASE, K. D. 634.11-1.541.11
Three year performance of sixteen varieties of apples on Malling IX rootstocks.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 321-7.

A report of trials at Geneva. In the first year after planting all the trees grew well, a few scattered blossoms were noted but no fruit was harvested. In the second, growth was again good despite a certain amount of so-called collar rot associated with winter injury which caused death in some cases, and a few fruits set on most varieties. In the third year there was again good growth. As the trees began to fruit the more slender branches tended to spread and droop. Each variety, however, developed also its characteristic habit of growth. All varieties blossomed a week to 10 days earlier than the same varieties on French Crab. Blossoming and set were high, necessitating heavy thinning. The number of fruits carried to maturity was, except for trees with a very light load, less than half the number remaining after thinning and seemed in general to be associated with the vigour and ability of an individual tree to carry a given number of fruits through to maturity. The fruit matured from a week to 10 days earlier on Malling IX than on French Crab seedling stocks. Fruits of red coloured varieties developed a very high colour. The size of fruit was above the average for the variety and was remarkably uniform for fruit from young trees. The general characteristics of the following varieties grown on Malling IX are given :—Baldwin, Cox's Orange, Early McIntosh, Gallia, Grimes, Jonathan, McIntosh, Northern Spy, Red Spy, R. I. Greening, Stark, Tompkins King, Turley, Wagener, Winesap, Wolf River.

709. BRADFORD, F. C. 634.11-1.541.44
Nursery behavior of certain European apple varieties of prospective value as trunk-formers.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 353-7.

Records are given of the first year's growth from bud at Glenn Dale, Maryland, of some 36 European apple varieties used in European nurseries as trunk-formers or reported as being highly resistant to winter cold.

710. HILBORN, M. T., AND WARING, J. H. 634.11-1.541.11
Terminal shoot growth of apple varieties as apparently stimulated by Virginia Crab and Hibernial intermediate stocks.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 316-20, bibl. 19.

The data reported from Maine Agricultural Experiment Station are from scion growth at least 3 years old. The differences noted may decrease with age. Both Virginia Crab and Hibernial used as intermediates on seedling stocks invigorated the scion varieties used in this trial including Baldwin, Delicious, McIntosh, Melba, Red Spy, Richared, Starking, and Wealthy.

711. FILINGER, G. A. 634.11-1.541.11 : 581.43
Soils and soil treatments affect the morphology of French crab roots.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 305-10, bibl. 1.

Preliminary studies at the Kansas Agricultural Experiment Station, Manhattan, indicate that soils and soil treatments influence the morphology and to some extent the anatomy of French crab seedlings. It is suggested that the study of stock scion effects on rootstock morphology should take place under conditions of similar soil and soil treatment if comparisons are to be made.

712. ANSALONI, A. 634.23-1.541.11
Porta innesti per i nostri ciliegi. (Cherry rootstocks.)
Riv. Frutticoltura, 1940, 4 : 147-8.

In this discussion the author holds that cherry stones from the Apennines will produce just as good rootstocks as those imported from other parts of Europe. A further article is promised on the selection of the wild cherry of the Apennines. R.M.I.

713. HEWETSON, F. N. 634.11-1.541.11
The effect of diploid and triploid seedling stock on the growth and yield of certain Jonathan apple trees.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 341-4, bibl. 5.

Observations made at East Lansing from 1935 to 1940 lead the author to the following conclusions:—1. Jonathan trees on triploid seedlings such as Baldwin are significantly smaller and have yielded less than trees worked on diploid seedlings Jonathan and Northern Spy. 2. There was no statistically significant difference in growth and yield between trees on diploid seedlings which were large and those which were small at time of planting. 3. Trees on seedlings of Yellow Bellflower, a diploid, produced less than half the yield of those on Jonathan and Northern Spy seedlings, though in growth they were comparable. 4. Size of fruits on "large" and "small" trees on diploid seedlings (Jonathan and Northern Spy) and on Yellow Bellflower seedlings averaged 0.24, 0.21 and 0.20 lb. respectively, while fruits on triploid seedlings averaged 0.14 lb.

714. SIEGLER, E. A. 634.11-1.541.11
"Non-infectious hairy root."
 Reprinted from *Amer. Nurseryman* Feb. 1, 1940, p. 1.
 SIEGLER, E. A. 634.11-1.541.11
Rootstocks for dwarfing apple.
 Reprinted from *Amer. Nurseryman* Dec. 15, 1940, pp. 2, bibl. 5.

In the first of these articles the author cautions nurserymen against using seedlings which show non-infectious hairy root in view of the unsightly malformations in the resulting 1- and 2-year-old nursery trees. In the second article he notes that the burrknot phenomenon is apparently similar to, if not identical with, the non-infectious hairy root phenomenon and is frequently a character of seedlings which will give dwarfing effects as stocks. He thinks that seedlings showing such tendencies are worth testing for their capacity as dwarfing rootstocks.

715. POLISHTSHOUK, A. D. 634.11-1.541
Influence of the original position of the scion used for grafting on the development of grafted apples. [Russian.]
Proc. Lenin. Acad. agric. Sci., Moscow, 1940, No. 13, pp. 14-8.

In field experiments conducted from 1935 to 1940 at the Voroshilovgrad Agricultural Institute, scions from 20-year-old apple trees of the varieties Snow Calvil and Champagne Reinette, taken

at the full fruiting stage, were grafted on to some 600 Paradise stocks, the scions being grouped according to age and tier (as illustrated). The results show that the age of the parent tree and the position of the scion in its crown affect the time at which the grafted tree begins to fruit. Thus, Snow Calvil trees grafted with scions from the second tier showed 84.6 and 71.4% of fruiting spurs during the first year of growth as compared with 44.4 and 32.3% in those grafted with scions from the first tier. Observations during 1940 showed that of the trees grafted with the second-tier scions 10 out of 12 and 6 out of 13 formed flowers, while none of the trees grafted with the first-tier scions produced any. It is concluded that several-year-old trees differ ontogenetically in their different parts. It is, therefore, important to know from which part the scions are cut, in order to be able to foresee and arrange the development of grafted trees.

Pollination.

716. LYMAN, W. C. 634.11 : 581.162.3

Pollination of Northern Spy.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 171-5.

An account of hand pollinating a Northern Spy apple orchard and thereby raising the crop by more than 50% over previous crops and developing a tendency to annual bearing. The author has found that, even if bees are set well within the block, if there is a competing bloom of earlier varieties, the bees will not work in the Spy orchard in the early stages of the Spy bloom.

717. DWYER, R. E. P., AND BOWMAN, F. T. 634.13 : 581.162.3

Pollination of Williams (Bartlett) pear in New South Wales. I. Investigation at Bathurst Experiment Farm 1928-1934.

Sci. Bull. Dep. Agric. N.S. Wales 62, 1938, pp. 1-46, bibl. 49.

ROBINSON, A. V.

634.13 : 581.162.3

Pollination of Williams (Bartlett) pear in New South Wales. II. The effect of varying seed content on the composition of the Williams pear.

Sci. Bull. Dep. Agric. N.S. Wales 62, 1938, pp. 47-58, bibl. 8.

In the first article the authors after a concise review of the literature on the subject discuss the behaviour of the Williams pear at Bathurst in the years 1928-1934. Self-fertility and cross-pollination studies were made. Among other facts established were the following:—The natural setting at Bathurst affording only limited cross-pollination gave satisfactory commercial crops. Much seedless fruit was produced and its carriage to maturity depended on season. Williams showed a very low order of self-fertility, viz. an average of 1 seed from 163 self-pollinations. Artificial cross-pollination gave nine times the set of all self-fruitfulness results and three times the average natural set. The chief pears grown in N.S. Wales are cross-fertile with Williams. Winter Cole is particularly suitable. The self-fruitfulness of Williams masks the value of cross-pollination. Interplanting should be carried out.

In the second article results of two seasons' trials are recorded on the effect of seedlessness on composition of fruit. Seed content showed no significant association with either soluble or insoluble solids content. Total sugars showed an increase with seed number. Free reducing sugars showed an increase with increasing seed number. The acidity, expressed as malic acid, showed no significant association with seed number. There was no significant association of nitrogen with seed number. The percentage of ash in the pulp showed a decrease with an increase in seed number.

*Growth and nutrition.**

718. MORELLI, A. 581.46 : 634.22

Sul pleomorfismo florale nel susino "Santa Rosa". (Pleomorphic flower formation in the Santa Rosa plum.)

Riv. Frutticoltura, 1940, 4 : 165-74, bibl. 26.

A comparison of the Japanese plum varieties, Santa Rosa and Burbank and the European greengage grown at Conegliano showed that anthesis occurs first in Santa Rosa followed in a few

* See also 672-695.

days by Burbank and a week later by greengage. The percentage of normal flowers is 60-70% in the Japanese varieties while it is nearly 100% in the European variety. Of the two Japanese varieties, Burbank has the greatest percentage of normal flowers, a lower percentage of pseudo-hermaphrodite flowers and an almost equal number of male flowers. The average percentage of flowers that can be pollinated is greatest in the European variety. In the case of Santa Rosa, the addition of nitrate 10-15 days before flowering appeared to favour the formation of perfect flowers. R.M.I.

719. GERBALDI, C. 634.25-1.55
 Note sull' andamento della cascola dei fiori e dei frutti nel pesco. (**Flower and fruit fall in the peach.**)
Riv. Frutticoltura, 1940, 4 : 175-80.

A study of flower and fruit fall in the four varieties of peach, Fior di Maggio, Bella di Roma, Carmen and J. H. Hale, indicated that for a similar period the fall of flowers and fruit was much greater in Fior di Maggio and Bella di Roma than in the other two. It appears that flower and fruit fall tends to diminish in the later maturing varieties. It is the opinion of the author that while flower and fruit fall varies with the season and conditions of cultivation, the variety exerts a considerable influence. R.M.I.

720. DAVIS, M. B., AND HILL, H. 634.11-2.19 +1.8
Apple nutrition.
Tech. Bull. Dep. Agric. Canada 32, 1941, pp. 32, being *Publication* 714.

The stated purpose of this bulletin is to educate apple growers to use the symptoms expressed by their trees as a guide to their fertilizer programme. Notes are given on the role and sources of the elements nitrogen, potassium, phosphorus, calcium, magnesium, boron, iron, manganese and zinc. The need for a balanced nutrition is stressed. Excellent colour plates and black and white illustrations afford a most useful key to the diagnosis of the deficiency in apple foliage of N, P, K, Mg, Fe and in the fruit of boron deficiency and of such other phenomena as bitter pit and blotchy pit. It is noted that manganese deficiency symptoms in the leaves can sometimes be differentiated from those of iron by the occurrence of dead spots on the manganese deficiency ones. There is no evidence of zinc deficiency in Canadian apple orchards. Finally, general fertilizer recommendations are made. The bulletin is strongly recommended to all apple growers.

*Manuring, soils and cultural practice.**

721. MEIER, K. 634.1/7-1.83
 Düngeversuche mit Obstbäumen. 6. Mitteilung. (**Fruit manurial trials.**
6th Report. K deficiency symptoms and the effect of K manuring on K-deficient soils.)
 Reprinted from *Landw. Jb. Schweiz* 1940, pp. 944-74.

An account is given of manurial experiments carried out at the Wädenswil Horticultural Research Station, Switzerland, between the years 1933 and 1940 with Cox's Orange Pippin on Malling IX rootstocks in pots filled with soil strongly deficient in potash and slightly deficient in P_2O_5 and in N. Its pH, originally 7.02, changed to 6.69-6.85 as the result of the use of acid fertilizers. The growth of the trees ran parallel with the amounts of potash available, the lack of potash showing itself in the well-known symptoms of general poor appearance, leaf scorch, gradually decreasing flower production, poor fruit production and finally, in some cases, the death of the deficient trees. Comparable symptoms were also noted in a similar trial with apricots. The cause of faulty growth and fruiting is probably not entirely lack of potash and phosphate but also, apart from the fact that there is not enough N in most soils, to lack of boron, on which point indications should be afforded by trials now in progress. Further trials should disclose the optimum amounts of potash necessary for growth and production. Wood analyses confirmed English and German findings that an antagonism exists between potash on the one side and lime, iron, magnesium (this was not very clearly seen at Wädenswil) and certainly phosphoric acid. They also show that the amount of mineral nutrients can be raised by appropriate manuring. These experiments together with observations on small fruit indicate why it has always been so difficult to grow fruit trees at Wädenswil.

* See also 785, 786.

722. WALLACE, T., AND OSMOND, D. A. 631.83 : 634.1/7-2.19
A preliminary note on the comparative effects of sulphate of potash, muriate of potash and kainit on various fruit plants.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 13-8, bibl. 2.

A plot was established at Long Ashton in January 1938 to compare the effects of sulphate and muriate of potash and kainit on apples, gooseberries, raspberries, red and black currants. Two seasons' results indicate that chloride-containing potassic fertilizers are likely to prove effective sources of potash for apples and black currants and are unlikely to produce chlorine injury. On the other hand such fertilizers would appear unsuitable for red currants and may entail risk to gooseberries and raspberries. There is in addition, of course, always a possibility of injury occurring as the result of careless application of kainit or muriate of potash to bush fruits when the fertilizers are wet.

723. WARNE, L. G. G. 631.83 : 634.1/7 : 581.11
Observation on the effect of potash supply on the tension of the tracheal contents in fruit trees and bushes.

J. Pomol., 1941, 19 : 82-6, bibl. 10.

Observations were made on Lane's Prince Albert apples on Malling II stock, Keepsake gooseberries and Lloyd George raspberries. The method used was to fix a small plasticine cup round the shoot to be tested, fill the cup with 1% acid fuchsin and stab the stem with a sharp knife beneath the surface of the dye solution in the cup and note results, estimating the tension of the tracheae by the extent of the dye penetration. In each type of material the dye penetration was significantly greater in the no-potash than in the complete fertilizer plants. This is taken to indicate that under the conditions prevailing a greater tension existed in the tracheae of the no-potash plants than in those of the trees and bushes receiving a complete fertilizer. The implications of these results are examined. It would appear probable from the evidence that the increased tension of the tracheal contents brought about by potash-deficiency indicates a more marked condition of internal drought and a nearer approach to the point at which internal drought becomes a critical factor in the tree's economy. Hence it is probable that in the no-potash material this critical point is likely to be reached much earlier than in the complete fertilizer material.

724. KHARLAMOFF, V. P. 634.11-1.8
Manuring the fruiting apple tree.

Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 14, pp. 18-21.

Manurial trials near Moscow showed that better apple crops can be obtained by applying mineral fertilizers as well as farmyard manure. The time at which the manuring is done is important as also proper pruning.

725. KHARLAMOFF, V. P. 634.1/2-1.87 + 1.4
On the problem of soil maintenance in orchards.

Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 11, pp. 19-21.

Two years' observations conducted on a tree and small fruit plantation near Moscow showed that leaving alternate rows in the orchards, which are sown with perennial grasses for soil reconditioning, under bare fallow for seven years, the fallow receiving mineral and organic manuring during that period, led to subsequent increases in fruit yields of from 7 to 56% according to crop, and to improved quality of fruit. This system, applied in conjunction with proper pruning and other cultural care, not only raises the fertility of the soil, but also provides food for cattle which in turn increases the manure supply.

726. VAN HAARLEM, J. R. 634.11-1.8-1.4
Some problems in orchard soil management.

46th A.R. Quebec pomol. Fruitgr. Soc. 1939, pp. 35-9.

The author discusses the problem of sod or clean cultivation as practised at Vineland, Ontario. Two different sod treatments have been tested in the orchard, namely a mixture of Kentucky Blue Grass, Red Top, Timothy and Orchard Grass against lucerne. The latter has proved the best over a period of years. The lucerne is not suitable for young orchards in the first few years after planting as its competition for nutrients is too great, but later its roots go so deep as not to compete so much with the orchard tree as the shallower-rooted grasses. The sod mulch

system consists of cutting the grass or lucerne and placing it round the trees under the spread of the branches. The sod is manured with farmyard manure and minerals including spring applications of nitrate of soda. The system is found to give slightly earlier bearing and much better colour than the clean cultivation cover crop method. Under it, however, mice are a serious plague. The combined use of $\frac{1}{4}$ -in. mesh wire round the trees and poison keeps them in control. Considerable use has lately been made at Vineland of a "killip" or deep subsoiling machine. This has a single chisel tooth which can be set to penetrate to 18 inches. It breaks up the subsoil for the roots to penetrate deeper and allows of better drainage. In addition it can be fitted with a fertilizer attachment and the use of this attachment has had very good results. It should be used in the autumn, as the shock caused by cutting any roots at this time will not be so great as in the spring.

727. BEACH, F. H.

634.11-1.87

Apple production under the mulch system.

Minn. Hort., 1941, 69 : 3-4, 25, 37.

Mulching in this case means the permanent maintenance beneath the orchard trees of sufficient decaying vegetable material to prevent all growth of weeds or grass from the trunks to slightly beyond the spread of the branches. The mulch is six inches deep with a bare cindered circle immediately surrounding the trunk as a precaution against mouse damage. Although benefits may be apparent from the start the mulch will not be fully built up for several years. Material for mulch is produced in the parts of the orchard not actually covered by branches. An established orchard therefore can only produce about half the amount required. The land growing the mulch must be adequately prepared and well manured and limed. The trend is to use mixtures of grass-clover sods. Dry straw may also be used but is expensive. The advantages of mulching in the case of Ohio, where the system is in force, are the maintenance of an available moisture supply during the growing season, formation of the best conditions for the utilization of mineral nutrients, reduction of erosion, increased penetration of water to the rooting zone, and maintenance of the highest level of organic matter in the rooting zone of the trees.

728. EATON, F. M., McCALLUM, R. D., AND MAYHUGH, M. S.

631.67 : 546.27 : 634.21 + 634.22

Quality of irrigation waters of the Hollister area of California.

Tech. Bull. Dep. Agric. U.S. 746, 1941, pp. 60, bibl. 16, 30 cents.

A consideration of the bad effects on apricot and prune trees of irrigating with water containing, in particular, excessive quantities of boron. In apricots the first symptom appearing on new growth is the dying back of shoot tips. Enlargement of nodes of first- and second-year twigs often occurs, as also gumming at the nodes. The flowering and retention of fruit is not directly affected, but new growth is restricted which in itself limits the size of crops and retards their development. Fruit of severely injured trees is undersized and necrotic areas may appear in the epidermis and the underlying flesh. The French prune is more tolerant than the apricot, but neither the Imperial prune nor the sugar prune is so tolerant as the apricot. In them symptoms are similar but more pronounced and the set of fruit of injured trees is much lower than in the apricot. Peach varieties affected by excess of boron vary in their ability to set fruit. The fruit tends to be insipid and poorly developed. Notes are given of the comparative tolerance of some 53 agricultural and ornamental plants to boron.

729. PADFIELD, C. A. S.

634.11-1.542

A note on the pruning of the Granny Smith apple tree.

N.Z. J. Sci. Tech., 1940, 22 : 108A-9A.

When worked on vigorous rootstocks in the Nelson district Granny Smith develops a very vigorous upright habit, leader growth of 4 ft. or more being common on 3- or 4-year-old trees. Fruitgrowers tend to cut the leaders as lightly as possible in early years, leaving $\frac{3}{4}$ or more of the annual wood on the tree. In the next growing season only the top 2 or 3 buds break to make lateral fruiting growth, and the result is a long bare leader. This characteristic remains and is likely, in fact, to become accentuated. The suggestion is made that a better policy would be to remove $\frac{1}{2}$ to $\frac{3}{4}$ of the annual leader-wood to ensure maximum lateral growth and leaf area on the rest of the leader. If growth becomes overcrowded the weaker, badly placed laterals can easily be removed.

730. JOHNSTON, S. 634.13-1.542
Pruning native Kieffer pear trees.
Quart. Bull. Mich. agric. Exp. Stat., 1941, **23**: 168-72.

The moderate heading method of several pruning methods studied seems the best suited to Kieffer pears in Michigan. Only those branches whose terminal growths are falling approximately below six inches should be cut back into the wood two or three years old. At the same time the oldest and weakest spurs are thinned throughout the tree. They are usually found in the centre of the older trees. The result is a gradual renewal of moderately vigorous new wood which will maintain a maximum yield of pears of first grade size.

731. BOWMAN, F. T. 634.22-1.542.27: 581.145.1
The influence of early times of fruit removal on the growth and composition of alternate-bearing sugar prune trees with special reference to blossom bud formation.
J. Pomol., 1941, **19**: 34-77, bibl. 55.

An account of experiments with sugar prune trees growing in the University Farm Orchard, Davis, Calif. Apart from those affected by thinning they showed a completely biennial bearing habit. They were subjected to irrigation. Fruit was removed at different times on four trees, on three of them before a critical time, i.e. 35 days after full bloom, and on one of them after this critical time. In seasonal growth differences of leaf area among treatments occurred between 26 and 35 days after full bloom and were due to the differential growth of the distal leaves of the spurs. The methods of measuring growth are discussed. Growth observations indicate that the removal of fruit after 9 weeks would not improve growth over that of a fruiting tree. The significance of the growth responses for blossom bud formation is considered to be due to the comparative amount of leaf growth which took place at the critical time. Fruit removal at the 4 different times caused the composition closely to approximate to that of an off-year tree in May, June and July. The late treated tree, however, showed intermediate values in May for insoluble N, K_2O and P_2O_5 content. Otherwise no constituent was found to be critically associated with the blossom bud initiation of the early treated trees or with the absence of blossom bud formation in the late treated tree. In seasonal development the sugar prune showed a double growth curve of which details are given. Flowering was found to inhibit completely the vegetative growth of 15-24% of the shoots of on-year trees. At the critical time for blossom bud formation the fruit was in the rapid period of growth in the first cycle, the moisture content was the highest for the season, the seed was in the nucellar stage and the first, second and early third drops had been initiated. The rapid rate of growth of an excessive crop at this time is thought to impose an abrupt check on spur leaf growth which prevents a change in bud development that would culminate in blossom bud formation. Fruiting caused clear and orderly changes in the defruited trees as regards content of moisture, reducing substances, sucrose and starch, nitrogen, potash and phosphorus. It is shown that the earlier stages of fruit growth alone, i.e. up to the critical time, did not influence the composition of the tree later in the season.

732. PALMER, R. C., AND FISHER, D. V. 634.11-1.542.27
Apple thinning investigations 1920-1935.
Tech. Bull. Dep. Agric. Canada **10**, 1937, pp. 27, bibl. 43.
 FISHER, D. V., AND PALMER, R. C. 634.11-1.542.27
A continuous apple thinning experiment conducted from 1920 to 1939.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, **38**: 193-5, bibl. 1.

Eighteen apple trees each of the varieties Newtown, Rome, McIntosh and Delicious were planted at Summerland, B.C., in 1916. A thinning experiment was started in 1920 and continued up to the time of the report in the *Proceedings*. In the earlier report a comprehensive survey of the literature was given. At that time no significant differences in total crop had resulted from the different treatments. Size of fruit had however been increased and a slight improvement had been brought about by heavier thinning, which had also tended to lessen biennial bearing and increase tree size. Results throughout the period now indicate that thinning of apples to as much as 9 inches apart can be done without sacrifice of crop; that heavy (9-inch) thinning, while somewhat more expensive than light (3-inch) thinning, may be justified with varieties

such as Delicious and Rome where comparatively large fruits are wanted; and that light thinning is preferable with varieties such as McIntosh and Newtown of which the small sizes are popular.

733. POWELL, H. R. 631.542.27 : 634.11 + 634.13

Thinning as related to the acquisition of apples and pears.

J. Dep. Agric. W. Aust., 1940, 17 : 502-5.

In view of the fact that the Federal Government of Australia is to purchase all apples and pears above a certain size the urgency of thinning to ensure that the bulk of the crop reaches acceptable size is stressed. Last season much fruit could not be assessed because, owing to drought, it did not reach the minimum size. Much of this loss could have been prevented by thinning. A schedule indicates how unprofitable it will be to grow apples of small size. Those of the "Good" ($2\frac{3}{8}$ -inch) grade in the case of Yates, Dougherty and Cox's Orange Pippin will not qualify for advances, and for the less choice apples the minimum size is $2\frac{1}{4}$ and $2\frac{1}{2}$ inch according to variety. Further information concerning the acquisition regulations is given in particular as concerns payments.

734. HODGSON, R. W., AND EGGERS, E. R. 634.16-1.542.27

Experiments on fruit-cluster thinning in the loquat.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 71-5.

The Japanese medlar or loquat (*Eriobotrya japonica*) in California blossoms in the autumn and fruits the following spring. Methods for increasing the size of fruit and concentrating the pickings in the early part of the fruit-ripening season have been investigated at Los Angeles on 4 varieties. The following tentative conclusions based on 2 years' trials are reached :—(1) That fruit-cluster thinning applied prior to the period of natural fruit drop materially increases the size of the fruit left. (2) That the increase in size of fruit resulting from fruit-cluster thinning is approximately proportional to the per cent of clusters removed. (3) The cluster-thinning which consists primarily of the removal of the late fruit-clusters materially increases the per cent of early ripening fruit. [From authors' summary.]

735. PETCH, C. E. 577.15.04 : 634.11-1.55

Harvest sprays with plant growth substances.

47th A.R. Quebec pomol. Fruitgr. Soc., 1940, pp. 7-11.

BLAIR, D. S.

577.15.04 : 634.11-1.55

Harvest sprays.

47th A.R. Quebec pomol. Fruitgr. Soc., 1940, p. 11.

Spraying entire apple trees at the beginning of fruit drop prior to harvest with various concentrations of naphthaleneacetic acid and three proprietary articles, viz. Stopdrop, Fruitone and Parmone, resulted in considerably increased crops and in many cases better colour owing to the longer retention on the tree. In general the sprays were more effective with summer than with autumn varieties. Results with different varieties are given.

736. RYALL, A. L., SMITH, E., AND PENTZER, W. T. 634.13-1.547.6

The elapsed period from full bloom as an index of harvest maturity of pears.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 273-81, bibl. 6.

Observations on Bosc, Anjou and Bartlett pears in the Yakima and Wenatchee Valleys of Washington in 1937, 1938 and 1939 indicate that the number of days from bloom in these districts, when used in connexion with firmness, ground colour and finish of fruit, will be a valuable adjunct to present indices in determining proper picking time.

737. TOMLINSON, F. R., AND VAN WYK, S. P. 634.1/8

An economic study of deciduous fruit farming in the Western Cape Province 1933-34.

Sci. Bull. Dep. Agric. S. Afr. 144, 1935,* pp. 47, being Stellenbosch Elsenburg Series 22.

BARNES, E. O.

581.192 : 634.11 + 634.22 + 634.8

Biochemical studies of some varieties of apples, plums and grapes grown in Minnesota.

Tech. Bull. Minn. agric. Exp. Stat. 143, 1940, pp. 35, bibl. 32.

* Received 1941.

- MANEY, T. J. 634.11-1.541.44
Records on a full crop yield of apple varieties topworked on various hardy stocks.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 345-7, bibl. 1.
 THOMAS, P. H. 634.1/2-1.541
Deciduous fruits. Variety, conversion, grafting and budding and tree surgery.
Bull. Dep. Agric. Tasm. 10, 1938, pp. 26.
 Clearly illustrated notes on the subject named in the title, and on inarching.
 COLLINS, C. M. 634.11-1.541
Grafting in Nova Scotia [apple] orchards.
Bull. Dep. Agric. Nova Scotia hort. Ser. 2, 1938, pp. 32.
 SCOTT, D. H., AND WAUGH, J. G. 634.25-1.531
Treatment of peach seed as affecting germination and growth of seedlings in the greenhouse.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 291-8, bibl. 8.
 Treatment is apparently more important than medium.
 TUKEY, H. B., AND BRASE, K. D. 577.15.04 : 634.1/2
Failure of seedlings of apple, peach, pear and rose to respond favourably to vitamin B₁.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 339-40.
 SCHRADER, A. L., AND HAUT, I. C. 634.11-1.541.11
Comparison of domestic apple and French crab seedlings as stocks under orchard conditions.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 328-30, bibl. 2.
 YERKES, G. E., AND ANTHONY, R. D. 634.11-1.541.11
Seedling apple stocks of known origin in nursery and orchard tests.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 331-5.
 MACDANIELS, L. H., AND HOFFMAN, M. B. 634.11-1.55
Apple blossom removal with caustic sprays.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 86-8, bibl. 1.
 A preliminary report on the use of Elgetol and Reico, a tar oil.
 COLLINS, C. M. 634.11-1.542
Pruning in Nova Scotia [apple] orchards.
Bull. Dep. Agric. Nova Scotia hort. Ser. 1, 1938, pp. 24.
 GRIGGS, W. H., AND SCHRADER, A. L. 634.11-1.542.24
Effect of branch ringing before and after blossoming on the fruit set of the Delicious apple.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 89-90.
 HALLER, M. H., AND OTHERS. 634.11-1.547.6
The relation of firmness to ripeness of Eastern-grown apples.
Circ. Dep. Agric. U.S. 579, 1941, pp. 21.
 ROSSI, L. 634.1/8-1.8
Lavorazioni del terreno e concimazioni organiche al frutteto. (The cultivation and manuring of orchards.)
Riv. Frutticoltura, 1940, 4 : 149-53.
 CLAYPOOL, L. L. 634.1/2 : 581.175.11
Red color increase in fruits after harvest following treatment with methyl bromide.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 289-90, bibl. 3.

SMALL FRUITS, VINES AND NUTS.

738. COLBY, A. S., ANDERSON, H. W., AND FLINT, W. P. 634.71
Bramble fruits : raspberries, blackberries and dewberries.
Circ. Ill. agric. Exp. Stat. 508, 1940, pp. 72.

Part I contains directions for the growing and marketing of bramble fruits in Illinois. Parts II and III provide information on the nature and control of injurious diseases and insect pests.

739. FILINGER, G. A. 634.71/72

Growing bush fruits in Kansas.

Circ. Kans. agric. Exp. Stat. 204, 1941, pp. 30.

The cultivation of raspberries, blackberries, gooseberries and currants in Kansas is described. The raspberries and some dewberries require winter protection and to achieve this the canes are buried in the soil or pinned down and covered with straw. Other cultural operations follow the usual lines.

740. VAN WYK, S. P. 634.872

An economic study of table-grape farming in Paarl, 1934-35 to 1936-37.

Sci. Bull. Dep. Agric. S. Afr. 197, 1939, pp. 47.

SACCONI, R., AND BOTTINI, H. T.

634.8 : 581.192

Comercialización de la uva por su riqueza glucométrica. (**Valuation of grapes according to sugar content.**) [English summary.]

Rev. As. Ing. agron. Uruguay, 1941, No. 1, pp. 7.

741. KLINE, L. V., AND CHASE, S. B. 634.51 : 581.192

Compilation of data on nut weight and kernel percentage of black walnut selections.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 166-74, bibl. 12.

Data are given from named sources of the nut weight and kernel percentage of some 212 black walnut selections.

742. GOSSARD, A. C. 634.521 : 577.15.04

Rooting pecan stem tissue by layering.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 213-4, bibl. 3.

The author has produced roots from pecan stems with considerable success by trench layering the tops of grafted or budded nursery trees and by air-layering shoots of older trees in marcot boxes in conjunction with indole-butyric acid treatment by the toothpick method of Romberg and Smith [see *H.A.*, 9 : 834 and 10 : 85].

743. BLACKMON, G. H. 634.521-1.811.9 : 546.27

Boron in pecan nutrition.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 209-10.

Boron appears to be necessary for pecans grown in nutrient solutions under controlled conditions.

744. GORE, U. R. 634.58-1.8

Culture and fertilizer studies with peanuts.

Bull. Ga agric. Exp. Stat. 209, 1941, pp. 19, bibl. 8.

An outline is given of the cultivation of peanuts in Georgia and of experiments in connexion therewith. The types grown are North Carolina Runner and White Spanish. On most soils best increases were obtained from 400 lb. per acre of a 6 : 6 : 6 fertilizer (supplying 24 lb. each of N, P and K). Various ways of applying this are mentioned. Little increase is obtained from applying fertilizer to soils which have already been heavily manured in the past.

PLANT PROTECTION OF DECIDUOUS FRUITS.

745. LINDFORD, T., AND HOLMBERG, C. 632.3 + 632.4 + 632.8

Växtsjukdomar i Sverige 1933-7. (Plant diseases in Sweden.)

Medd. Stat. Växtskyddsanst. Stockh. 33, 1941, pp. 131.

A comprehensive account of the diseases attacking cultivated plants in Sweden during 1933-7. Attention is chiefly given to plants of economic value but diseases of ornamentals are tabulated under the plant names at the end of the bulletin.

746. DUNLAP, A. A. 632.3 + 632.4 + 632.8

Plant diseases in Texas and their control.

Circ. Tex. agric. Exp. Stat. 91, 1941, pp. 70.

Part I lists various crops in alphabetical order and treats of their more common diseases and methods for control. The information is conveniently tabulated for quick reference. Part II

deals with diseases that attack many kinds of plants. Part III gives specific information about methods used in the control of plant diseases and with directions for the preparation and application of various fungicides.

747. DORSEY, M. J. 634.11 : 581.145.2 : 632.111

The low temperature hazard to set of fruit in the apple.

Bull. Ill. agric. Exp. Stat. 473, 1940, pp. 147-70, bibl. 13.

The author describes the type and extent of frost injury to apple flower buds in Illinois and other States in early spring and during the dormant season. Recovery from injury of the less severe type resulting merely in a separation of the scion from the young apple is dealt with in detail. Studies were made in apple orchards during the spring frosts of 1923 and 1936 and in the spring and autumn of 1938. Controlled freezing tests were also carried out in storage rooms in the spring of 1936 with a more gradual drop in temperature, in order to determine the temperature at which ice masses form in succulent apple tissues. Observations in both cases showed that this occurred at approximately 28° F. The cells were not often ruptured, but were broken apart, apparently at the middle lamella, and at a depth of 3-5 cells on the fruits. If separation of the cells occurred in the autumn, it persisted during the dormant season, but under favourable conditions in spring the tissues began to mend by the outward growth of occasional cells from the surfaces of cleavage. Thus, this skin separation damage did not necessarily reduce the crop. Interruption of the mending process by recurring spring frosts sometimes caused activity of the cork cambium resulting in russetting on the apples. Fruit set was (materially) reduced when the ovules were injured. If all the ovules were killed, the fruits dropped; when only a part of the ovules were killed however the fruits set and matured, but were characterized by a low seed content. C.P.F.

748. FILEWICZ, W., AND MODLIBOWSKA, I. 634.11-2.111-1.541.11

The influence of a scion variety on the resistance of the roots against frost.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 348-52, bibl. 3.

Observations made at Sinoleka, Poland, in 1938 and 1939 on frost resistance of seedling and clonal (Malling) apple rootstocks budded or grafted with different scions of different origin lead to the following conclusions:—(1) The scion has great influence on the frost resistance of the rootstock. Thus Antonovka, although itself a very hardy variety, increased frost susceptibility and damage in both seedling and Malling IX rootstocks when worked on them. 81% of Malling IX budded with Antonovka died from frost in the winter of 1938/9 as against 14% of Malling IX budded with Cox's Orange Pippin. (2) The origin of the seedling stocks, i.e. Northern and Central or South-eastern Poland, had considerable effect on their frost resistance when budded with Croncels or Boiken. (3) The grade of seedling influenced frost susceptibility, grade 1 being considerably more resistant than grade 2. (4) The type of soil influenced frost susceptibility.

749. STUART, N. W. 634.11-2.111-1.541.11

Cold hardness of Malling apple rootstock types as determined by freezing tests.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 311-4, bibl. 5.

The various Malling apple rootstocks were tested for cold hardness by the method which involves the conductimetric estimation of electrolyte exosmosis from stems or roots as a result of freezing injury. The relative hardness of 1-year stems in descending order of hardness as determined by this method after freezing 5 gm. samples at -15° F. was III, XIII, VII, XVI, IV, V, II, XII, IX and I and after freezing 1 gm. samples at +20° F. III, VII, XVI, IV, V, XII, IX, I, XIII, II.

750. SUDDS, R. H., AND MARTH, P. C. 634.11-1.541.11-2.183

Wind damage to apple trees on selected rootstocks Kearneysville, West Virginia, July 28, 1940.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 299-304, bibl. 304.

The results of a severe electrical storm accompanied by high winds of an unknown velocity on apple trees on known rootstocks are given and discussed in this paper. There were 3 blocks of trees all of which were more or less equally exposed to the wind. Block A 1,729 trees—Gallia Beauty, Starking, Staymared and York Imperial on various stocks. Each variety showed more

injury on the clonal stocks as a group than on the seedlings, i.e. 11.3% as against 5.5%. Of the trees on clonal roots those on 316 and 317 suffered worst, those on Malling XIII and Malling XV least. *Block B* 124 trees—York Imperial, Gallia Beauty, Jonathan, Staymared, Golden Delicious and Starking on Malling II. These trees were evidently well anchored and only 6 out of the 124 were blown over or broken off. In the one tree that was actually broken off the fracture was in rootstock tissue a few inches below the probable zone of union. *Block C* 124 trees—chiefly Stayman Winesap and Red Rome on Malling XIII and of Starking and Red Rome on Malling I. In the case of Red Rome on Malling XIII only 1 tree out of 54 was blown over. In Red Rome on Malling I, 13 were blown over and 2 broken off out of 29. With Stayman on Malling I, 2 trees were blown over and 2 badly split out of a total of 13. Finally the 28 trees of Starking on Malling XIII showed no visible injury of any type.

751. CUMMINGS, M. B., AND DUNNING, R. G.

634.11-2.19

Bitter pit of apples. I. In orchard and storage.

Bull. Vt agric. Exp. Stat. 467, 1940, pp. 30, bibl. 22.

The bulletin presents data secured in the State of Vermont concerning bitter pit of apples and discusses its development in storage at different temperatures. Discussion on the histology of the skin or the flesh of the fruit is deferred to a later paper. The erratic nature of pit is pointed out; only a few varieties are affected and not all the apples on an affected tree or even in the same cluster will show the disease at harvest or later in store. Development in store ceases after mid-winter so that unaffected fruit can be separated and sold. Development is seemingly linked with the varietal rate of ripening for it discontinues earlier in Arctic than in Spy. It develops faster and ceases earlier in ordinary than in cold storage.

752. HILL, H.

634.11-2.19 : 631.811.6

Progress report, magnesium deficiency, Frelighsburg and Progress report, magnesium deficiency, in apple orchards of Frelighsburg district.

46th A.R. Quebec pomol. Fruigr. Soc. 1939, pp. 8-11 and 47th A.R. 1940, pp. 12-5.

The author had reported symptoms of magnesium deficiency at the 1938 meeting. In these two reports the story is taken further. He reports again on symptoms in different apple varieties and stresses the fact that magnesium deficiency results in increased spray injury. In the spring of 1939 the soil was treated with magnesium sulphate or sulphate of potash magnesia at the rate of 17, 25, 34 and 51 lb. MgO per acre or with dolomite limestone at 1,000 lb. per acre. This did not give successful results and the magnesium level in the leaves remained unaltered. In his 1940 report the author admitted that progress was slow and noted that the problem was found to be complicated by the fact that the amount of available calcium in the soil should be in a certain ratio to the amount of available magnesium. The addition of enough soluble magnesium to correct deficiency may therefore result in calcium deficiency. Leaf analysis shows that the addition of 12 lb. magnesium sulphate per tree lowered the calcium in the leaves from 30 to 23% without making good the magnesium deficiency. Trials were made of applying 12 lb. magnesium sulphate and up to 20 lb. calcium magnesia compounds per tree to trees found deficient in the previous year, by broadcasting on the permanent sod under the trees. The result was to increase the water soluble magnesium in the sod layer only. Only in one instance of magnesium sulphate application was there infiltration below the sod level and in this case the magnesium level in the leaf was slightly increased. Hence it is suggested that for quick reaction it is essential that the magnesium should be actually incorporated in the soil by ploughing (dangerous for roots), hand-digging, drilling with crowbar, or insertion by special rod or gun attached to a power sprayer. Spraying with 1% magnesium sulphate incorporated in two lime-sulphur sprays is thought to have decreased the magnesium deficiency symptoms in one case. Further trials will be made, spraying 4 times instead of twice. It is noted that magnesium deficiency symptoms are most noticeable in the presence of ample potash supplies.

753. BLACKMON, G. H.

634.25-2.19 : 546.47

Zinc as a corrective for little-leaf of peach in Florida.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 46-9.

Little-leaf in peach was controlled by zinc sulphate applied either to the soil or as a foliage spray. The growth was also greatly improved by such treatment of affected trees.

754. HILDEBRAND, E. M. 634.25-2.8

Rapid transmission of yellow-red virosis in peach.

Contr. Boyce Thompson Inst., 1941, 11 : 485-96, bibl. 5.

Yellow-red virosis or "x"-disease of peach, which up to the present has been difficult to transmit by budding, was easily transmitted with the production of symptoms within one month by cutting off the tops of the inoculated plants. This apparently liberated the virus from the diseased bud and enabled it to spread through the plant. The technique may be useful in the study of other viruses. Experiments on the heat inactivation of virus in budwood resulted in buds receiving heat treatment at 50° C. for periods of 6-15 minutes all surviving but failing to transmit the disease, whereas the controls all became diseased.

755. SERBINOFF, V. I. 634.21-2.3

Spotting of apricots and its control. [Russian.]

State Publication Office Tadzhiik S.S.R. Stalinabad-Leningrad, 1940, pp. 60.

In studies conducted at the Scientific Research Institute for fruit, vine and vegetable cultivation in the Tadzhiik S.S.R. [Russian Central Asia] from 1935 to 1938 it was found that spotting of apricots often occurs in the absence of *Clasterosporium carpophilum* which is generally believed to be the causal agent of this disease. Isolates from diseased apricot tissues yielded a bacterium similar to *Bacterium pruni*, and the pathogenicity of this organism was proved in both greenhouse and orchard inoculations, the symptoms produced being identical with those observed on naturally infected trees. It is concluded that the spotting is caused chiefly by this bacterium, though *C. carpophilum* may play some part as well. The disease is stated to attack mainly the fruits under Tadzhiik conditions, leaves and stems being affected to a lesser degree. Infection is spread by rain. It is believed that the inoculum accumulates during the winter in gumming wounds and that in spring the rains dissolve the gum and wash it on to the lower shoots, leaves, and fruits. Observations over many years show that infection occurs five to six days after the first rain following blossoming, but a period with an air humidity of not less than 70% is essential for infection to take place. Proper care of the orchards and timely removal of dead branches tend to reduce infection. The sweeter varieties appear to be the most susceptible. In Russian Central Asia, and in particular in the Tadzhiik S.S.R., widespread infection of apricot orchards occurs every year. Data obtained from typical orchards showed that the spotting caused a reduction of 27-57% in the weight of the fruit, the average loss due to the trouble being calculated as 13-58% of the whole crop of a given tree. The disease also causes a decrease in the sugar content of the fruit and generally reduces the commercial grade. None of the fungicides tested gave complete control of spotting, but in 1937 trials two applications of 1% Bordeaux mixture, the first after blossoming and the second 15 days later, reduced the percentage of diseased fruit harvested from 91.9 in the untreated control to 78.3, the corresponding percentage for lime with sulphur (ground sulphur 1 to 1.5 parts, quicklime 1 to 1.5 parts, and water 100 parts) being 80.8.

756. DU PLESSIS, S. J. 634.8-2.314

Bacterial blight of vines (Vlamsiekte) in South Africa caused by *Erwinia vitivora* (Bacc.) Du P.

Sci. Bull. Dep. Agric. S. Afr. 214, 1940, pp. 105, bibl. 62.

This vine disease was first noted in S. Africa in 1936. Its symptoms seem to be similar to those of the disease or group of diseases known as mal nero in Italy, gommose bacillaire, gélivure or maladie d'Oleron in France. Varieties show great differences in susceptibility and a preliminary classification has been made. Attempts to control the disease by chemical methods have so far been unsuccessful. Recommendations are made of selection and cultivation methods likely to help.

757. HILDEBRAND, E. M. 632.314 : 634.71

Cane gall of brambles caused by *Phytophthora rubi* n. sp.

J. agric. Res., 1941, 61 : 685-96, bibl. 21.

Cane gall, a disease of *Rubus* spp., has been readily isolated from young galls and its pathogenicity proved. The characteristic beading and elongated gall ridges on the above ground canes distinguish it from crown gall which occurs at or below ground level. The name proposed for this organism is *Phytophthora rubi* n. sp.

758. KEITT, G. W., CLAYTON, C. N., AND LANGFORD, M. H. 634.11-2.42
Experiments with eradicant fungicides for combating apple scab.
Phytopathology, 1941, 31 : 296-322, bibl. 11.

Apple orchards sprayed after harvest and before leaf-fall with a lime-copper-arsenic mixture (no summer spray) showed a reduction of 97-100% in incidence of fertile perithecia of *Venturia inaequalis* in the overwintered leaves and a closely corresponding reduction in ascospore infection compared with untreated orchards. The spray reduced incidence of lesions by 91-98% in 3 successive years. Treatment of overwintered leaves on the ground with Elgetol Extra 1% by volume in water at the rate of 450 gal. per acre proved very effective in limiting development of ascospore inoculum. Recommendations for the employment of this treatment are withheld pending further study, but the general principles are established (a) that the dosage of the primary inoculum is a major factor in determining the time and intensity of epidemic development; (b) that the time and intensity of the development of the epidemic are major factors influencing the requirements for its control.

759. STAEHELIN, M. 634.711-2.42
 Une dangereuse maladie des sarments du framboisier. (**Spur blight of raspberry in Switzerland.**)
Publ. Stat. fed. Essais vitic. arboric. Lausanne, 290, 1940, pp. 3.

A disease of raspberry canes, long known in U.S.A. and parts of Europe but first reported in Switzerland only in 1915, is caused by the fungus *Didymella applanata*. The young shoots are attacked in June-July. Long purplish patches are formed which spread along and ultimately destroy the season's growth. Curative treatment is impossible, but canes which fail to shoot in the spring should be cut out and burnt. Preventive treatment is fairly effective and consists in spraying with bordeaux mixture after flowering in mid-May and again in winter and dusting with copper dust in August-September.

760. PLAKIDAS, A. G. 634.75-2.4
Purple leaf spot of strawberry.
Phytopathology, 1941, 31 : 225-40, bibl. 15.

An undescribed leaf spot of strawberry with symptoms very similar to those of leaf scorch is reported from U.S.A. The causative organism appears to be a new species of *Mycosphaerella* and has been provisionally named *M. louisianae*. The investigations in connexion with this fungus are fully discussed.

761. SNAPP, O. I. 634.25-2.7
Insect pests of the peach in the eastern States.
Frmrs' Bull. Dep. Agric. U.S. 1861, 1941, pp. 34.

Ten species and one group (sucking bugs) of insects attacking peaches in eastern U.S.A. are dealt with from the point of view of control.

762. FLINT, W. P., AND FARRAR, M. D. 635.977.8 : 632.7
Protecting shade trees from insect damage.
Circ. Ill. agric. Exp. Stat. 509, 1940, pp. 59.

Notes on the incidence and control of common pests on the following ornamental trees in Illinois:—Ailanthus, ash, beech, birch, horsechestnut, catalpa, crabs and hawthorns, elm, ginkgo, hockberry (*Celtis*), hickory and walnut, lime, maple, mountain ash, oak, poplar, sycamore, willow, evergreens, larch.

763. JACOB, F. H. 632.753
The over-wintering of *Myzus persicae* Sulz. on *Brassicaceae* in North Wales.
Ann. appl. Biol., 1941, 28 : 119-24, bibl. 3.

From evidence produced it is concluded that *Myzus persicae* Sulz. overwinters readily in the wingless form on *Brassicaceae* under favourable conditions. In hard winters few succeed. High infestations of the potato crop in N. Wales seem to follow winters when widespread hibernation on *Brassicaceae* has occurred. Outdoor peaches probably are of minor importance as winter hosts but strong migrations from glasshouses may occur in spring and early summer.

764. GREENSLADE, R. M. 634.75-2.753
The migration of the strawberry aphid (*Capitophorus fragariae* Theob.).
J. Pomol., 1941, 19 : 87-106, bibl. 16.

Most of this paper is concerned with the behaviour of the winged generations of the strawberry aphid (*Capitophorus fragariae*). These generations are economically important as they spread virus disease. The spring winged aphides are adult for a short period in May or June and often occur in large numbers. The autumn ones are fewer but occur over a longer period. Charts are given of the temperature, relative humidity and wind speed during these periods and they show that extensive migration is likely to occur only during comparatively short periods. They also show that, although the extended migration of the autumn winged generation is unusual, it can sometimes occur and hence that the transmission of viruses is possible at that time. Migrating aphides only fly when the wind speed is very low. They can undoubtedly migrate further than 400 yards. Laboratory experiments with artificial light, strawberry leaves and grass indicate that the sense of smell is not concerned with the choice of a host plant by the aphids.

765. MASSEE, A. M. 632.76 : 634.1/7
The British brown and green leaf weevils associated with cultivated fruit trees and bushes.
J. Pomol., 1941, 19 : 78-81, bibl. 4.

Short accounts and a key for identification are given of the following species of leaf-eating weevils:—*Phyllobius oblongus*—brown leaf weevil, *P. pyri*—common leaf weevil, *P. calcaratus*—leaf weevil, *P. argentatus*—fruit leaf weevil, *P. maculicornis*—green leaf weevil. *P. pomonae* and *Polydrosus cervinus* are also mentioned.

766. BOVEY, P. 634.13-2.76
Un moyen de lutte efficace contre l'anthonome d'hiver du poirier. (A satisfactory method of controlling the winter pear weevil, *Anthonomus pyri* Killar.)
Publ. Stat. fed. Essais vitic. arboric. Lausanne 294, 1940, pp. 5, bibl. 7, being reprinted from *Rev. hort. suisse*, 1940, 13 : 239-43.

The treatment consists of a thorough spraying of the pear trees at the end of September, when the weevil is active in the foliage, with an insecticide in which pyrethrum is the killing agent. If the trees are heavily attacked a second spraying 8 days later can be given. It is claimed that the method is most effective; the photographs given support this statement.

767. McKENNA, G. F., AND HARTZELL, A. 632.76
Effect of wetting agents in increasing the efficiency of sprays used in control of Japanese beetle.
Contr. Boyce Thompson Inst., 1941, 11 : 465-71, bibl. 5.

A series of 34 wetting agents in combination with lead arsenate and rotenone sprays was tested for control of Japanese beetle adults. Ultrol proved the best wetting agent, a good sticker, easy to handle, non-injurious to plants or man and combining well with the principal insecticides.

768. CHAPMAN, P. J., AND HESS, A. D. 664.85.11.037 : 632.77
Mortality of the apple maggot in fruit held in cold storage.
Circ. Dep. Agric. U.S. 600, 1941, pp. 9.

Complete mortality of the apple maggot (*Rhagoletis pomonella*) eggs and larvae was obtained in store within 32 days at an air temperature of 32° F. and within 45 days at 36° F. Thus 40 days at 32° F., the usual temperature for cold stores, should provide ample time for disinfesting fruit.

769. HART, F. P. 634.11-2.78 + 2.77
The codling moth and apple maggot in relation to the Hudson Valley apple market.
Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 305-9.
 ANDERSON, R. C. 634.11-2.78
The place of pruning in codling moth control.
Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 309-13.

HAMILTON, D. W. 634.11-2.78
Orchard sanitation and measures supplementary to spraying for codling moth control.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 313-8.

HAMMER, O. H. 634.11-2.78 + 2.77

Field tests for codling moth and apple maggot control and the implications of the new residue tolerance.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 318-28.

VAN ALSTYNE, A. 634.11-2.78

A new kind of codling moth control.

HOWARD, L. 634.11-2.78

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 328-30.

The codling moth fight from the growers' standpoint.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 330-5.

EVANS, J. A. 634.11-2.78 + 2.77

Summation and conclusions.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 335-9.

A symposium on codling moth (*Carpocapsa pomonella*) and apple maggot (*Rhagoletis pomonella*) control. Among sanitation measures mentioned as necessary are the elimination of neighbouring infested orchards, pruning to enable spraying to be properly carried out and to penetrate adequately, and under certain special cases (1) the screening of packing houses used for storage of crates and (2) the scraping and banding of trees. Timeliness and thoroughness of spraying are always essential. Lead arsenate will generally suffice for light infestations, given in 3 applications, but for heavy infestations second brood sprays will also be necessary and sprays roughly will be as follows, 1st, 2nd and 4th, lead arsenate; 3rd, 5th and 6th, nicotine with or without oil.

770. STAEHELIN, M., AND BOVEY, P. 632.78 + 632.42 : 634.11 + 634.13

La lutte contre le carpocapse et la tavelure des pommiers en Suisse romande.

(Control of codling moth and scab in apples and pears in French Switzerland.)

Reprinted from *Annu. agric. suisse*, 1940, pp. 635-80, being *Publication 293*.

Codling (*Laspeyresia pomonella* L.) has been controlled during 1933-38 in French Switzerland. The following observations are made:—(a) calyx spray applied 2-4 weeks before the moths emerge is still the basic treatment; (b) an arsenical spray is worth applying 8-12 days after emergence has begun; (c) a third arsenical spray is necessary within 2-3 weeks of the second to protect the fruit of late varieties. Scab (*Venturia inaequalis*).—The importance of the pre- and post-blossom sprays is emphasized, together with late spraying for keeping varieties. It was not found possible to improve with certainty upon the normal treatments. Full details of the methods employed are contained in the paper.

771. DOTTI, F. 632.78

Necessità dei mezzi sussidiari nella lotta contro la *Cydia pomonella*. (Subsidiary control of codling moth essential.)

Riv. Frutticoltura, 1940, 4 : 181-5.

The destruction of the larvae in the packing boxes by means of heat and fumigation is advocated. R.M.I.

772. BRAIR, J. H. 634.22-2.793

The control of the plum sawfly (*Hoplocampa flava*).

Agric. Bull. Palestine, 1940, Oct.-Dec., pp. 165-6.

The plum sawfly, a troublesome pest in Palestine, can be controlled by spraying with a quassia and soap solution applied for early and mid-season varieties when 90% of the petals have fallen and in the case of late flowering varieties when petal fall starts. Correct timing is important.

773. MILLARD, W. A., AND STUBBS, J. 632.51

Eradication of bracken.*

Agriculture, Lond., 1941, 48 : 11-5.

Experiments on the control of bracken are described. These have been in progress for a number of years. On intake land, i.e. land that has been previously cultivated and reverted to bracken,

* See also 655.

a single tractor ploughing may be sufficient. Such land is often more fertile than reclaimed grass. It lacks phosphate but is rich in potash and the wireworm population is very low. Moorland bracken is dealt with by cutting or breaking. June breaking gives better results than July breaking. Two breakings a year in June and September have given by far the best results. After two years' breaking some grazing is often possible, but the treatment must continue for two or three years longer. Even on moorland, wherever possible, the plough is best.

774. DODD, A. P. 632.51 : 632.96

Biological campaign against prickly-pear.

Commonwealth Prickly Pear Board, Brisbane, 1940, pp. 177, bibl. 34.

A record of the biological investigations carried out by the Commonwealth Prickly Pear Board from 1920 to 1940 which has resulted in the virtual control of this major pest by the larvae of the moth, *Cactoblastis cactorum*, of which only one introduction was ever made, i.e. from the Argentine in 1925. By the agency of this insect 25 million acres of heavy pear in Queensland alone have been reduced to 100,000 acres.

775. KEARNS, H. G. H., AND MARTIN, H. 632.951.8 : 634.1/7

War-time winter spraying for the control of insect pests of fruit.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 57-62.

Practical consideration for wartime. The authors first discuss the types available, namely tar oil emulsions, petroleum oil emulsions, emulsions of mixed tar and petroleum oils and emulsions of petroleum oil containing an organic thiocyanate or dinitro-ortho-cresol. They then note the programmes advisable for the different fruits and finally deal with the actual application of the sprays.

776. POTTER, C. 632.951

A laboratory spraying apparatus and technique for investigating the action of contact insecticides with some notes on suitable test insects.

Ann. appl. Biol., 1941, 28 : 142-69, bibl. 15.

An outline of the general problem of the evaluation of liquid contact insecticides is given. A summary of the laboratory methods of evaluation already described and the reasons for the adoption of the procedure described are outlined. An account is made of the development of the spraying apparatus together with experiments on factors likely to cause variation in the replication and distribution of the deposit. The apparatus finally adopted is described and data are presented on its physical performance. The selection and rearing of test insects is described. An account is made of the factors in the technique which may cause errors in the determination of the dosage-mortality data, with some experiments. The technique at present adopted is described, with examples of the dosage-mortality curves obtained. [Author's summary.]

777. FREAR, D. E. H., AND WORTHLEY, H. N. 634.11-2.951

Deposition and retention of sprays on apples. II.

Bull. Pa agric. Exp. Stat. 400, 1940, pp. 22, bibl. 12.

A report on the residues of lead and of arsenic found by chemical analysis on apple fruits, Jonathan and Stayman Winesap, sprayed with acid lead arsenate in various schedules and mixtures in 1937 and 1938.

778. TYDEMAN, H. M. 634.11-2.952.1

The inheritance of susceptibility to sulphur damage in families of seedling apples.

J. Pomol., 1941, 19 : 137-45, bibl. 8.

Details of the reaction of seedlings from crosses between numerous apple varieties to spring applications of sulphur compounds for controlling scab are given. Where one parent was the very susceptible Stirling Castle the proportion of sulphur-shy seedlings was unusually high, though varying according to the other variety used as parent. Families in which White Transparent, Cox's Orange Pippin and Rote Sommer Apfel were used as one parent contained on the average from 7 to 54% of sulphur-shy seedlings, but great variation was found in the individual families. With most of the other varieties used as parents [e.g. Yellow Ingestrie, Devonshire Quarrenden, Laxton's Superb, Brownlee's Russet, McIntosh Red, Golden Delicious] there was

only a small proportion of sulphur-shy seedlings in the families. It is concluded that sulphur shyness in apples is controlled in inheritance by genetic factors and that a number of genes are involved. [From author's summary.]

779. STUART, N. W. 634.11-2.111
Cold hardness of seedlings from certain apple varieties as determined by freezing tests.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 315.
 Abstract only. To be published as U.S.D.A. publication.
- BODINE, E. W., AND DURRELL, L. W. 634.25-2.8
Host range of peach-mosaic virus in Western Colorado.
Phytopathology, 1941, 31 : 322-33, bibl. 7.
- HILDEBRAND, E. M. 634.25-2.8
A new case of rosette mosaic on peach.
Phytopathology, 1941, 31 : 353-5, bibl. 3.
- MILLER, D. 634.8-2.78
The Australian grape-vine moth (*Phalaenoides glycine*).
Cawthron Inst. Publ. 41, 1940, pp. 2.
 Recognition and control.
- HARTMANN, H. T. 632.952.2
Tests with new copper fungicides with special reference to injury, tenacity to foliage and dwarfing effect.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 148-52.
- CHRISTOPHER, E. P. 632.952.2
The bordeaux formula in horticultural research.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 153-6, bibl. 12.
- PICKETT, W. F., AND BIRKELAND, C. J. 632.95
Common spray materials alter the internal structure of apple leaves.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 158-62, bibl. 5.
- FAES, H., AND STAEHELIN, M. 632.952.2 : 634.8-2.411.4
 De l'action accélératrice des bouillies cupriques sur l'évaporation de la pluie, du brouillard ou de la rosée mouillant les feuilles de vigne. (The quickening effect of copper sprays on the evaporation of rain, mist and dew from vine leaves.)
Publ. Stat. fed. Essais vitic. arboric. Lausanne 295, 1940, pp. 8, bibl. 13, reprinted from Chron. vitic., Nov. 1940.
- KEARNS, H. G. H., AND MARTIN, H. 632.951.8
The preparation of dinitro-ortho-cresol emulsions.
A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 55-6, bibl. 1.

VEGETABLE GROWING, STIMULANTS, ETC.

780. BOYES, D. 635.1/7 : 631.531
Vegetable seeds from the garden.
Occ. Publ. hort. Educ. Ass., April 1941, pp. 9-28.

A great deal of information on the saving of seed of various garden vegetable crops is provided in this paper. Published information on this subject has hitherto been difficult to obtain since the home gardener has always, and probably wisely, preferred to purchase his seed as required and more often than not the source of supply was foreign. Present circumstances render it important that the gardener should attempt to grow seed for himself. This very useful paper will tell him how and, quite a consideration in these days, will save him money. Such an opportune and useful treatise deserves the widest circulation.

781. HOBBS, E. W.

635.1/7

A report on six 10-rod demonstration allotments in the Bristol district in 1940.*A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 42-9.*

An account of the successful practical application in the Bristol district of the recommendations made in the Ministry's *Growmore Bulletin* No. 1, 1939, revised Feb. 1941; *H.A.* 10: 420. Among practical conclusions reached the following may be noted:—(1) The breaking up of old grazing land may not necessarily render manuring unnecessary. (2) The digging in of the turf improves tilth but care must be taken that sufficient consolidation is achieved if digging is done late. (3) Vegetable compost may supply about one-third of the manurial requirements of the area. (4) Economy should be possible in the amount of seed suggested in the bulletin. (5) The arrangement of crops is simple and workable. (6) The vegetables thus produced, provided potatoes are kept down to one-sixth of the area, should supply the normal needs of a family of 3 or 4.

782. VESSELOVSKY, I. A.

635.1/7 : 631.544

Growing vegetables under electric light.*Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 18, pp. 17-8.*

In experiments started in 1939 in a cellar by the Leningrad Fruit and Vegetables Institute onions were grown in boarded up beds composed of a mixture of 75% sand and 25% compost, under constant electric light, 14 bulbs 200 to 300 watts each, with reflectors, being fixed over the 17.5 sq. metres used. Prior to planting the selected onions were soaked in warm water (30° C.). 45 kg. were planted on 2.5 sq. metre area. A constant temperature of 20° to 24° C. prevailed throughout the experiment and the plants were abundantly watered with warm water. The upper limit of growth, 30 to 40 cm., was reached 14 to 15 days after planting which compared favourably with 20 to 60 days required under natural conditions. Similar experiments, but on a small scale, were carried out with *Allium fistulosum* which grew even quicker than onion and gave larger amounts of green.* Single plants were grown of chicory, celery, parsley, mangold and beetroot grown for leaves. From a nutritional point of view parsley, celery and chicory were of particular interest, since their green parts could be cut and used every 20 days, giving a vegetable with a very high content of vitamin C. Mangold was found unsatisfactory.

783. DARKE, J. E.

631.544 : 631.8

Manurial treatment of glasshouse crops.*Fruitgrower, 1941, 91 : 467-8.*

For the success of manurial treatments the soil must be in good physical condition. Much depends on adequate humus. The best way of obtaining quick results is to apply in one year a heavy dressing of good sphagnum peat in addition to the usual dressings of long-straw manure and either to dig in the walls of straw as advocated by the Cheshunt Research Station or to mix in considerable quantities of chaff. Done over a period of years a good physical condition with a reserve of humus will result. The author then goes on to explain the use of base manures and some dangers attached to them and the correct use of applying fertilizers.

784. SAPOUN, M. P.

635.1/7-1.8 : 577.16

The effect of mineral fertilizers and lime on the content of vitamin C in vegetables.*Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 17, pp. 28-32.*

In experiments started in 1935 at the Agrotechnical Laboratory of the White Russian Fruit-Vegetable Experiment Station, the use of fertilizers and green manures in crop rotation was found to induce considerable increases in the amount of vitamin C in vegetables. Thus the vitamin C content of cabbage was increased from 16.6 mg. per cent in the control (land receiving farmyard manure only) to 26.7 mg. by the application of NPK and lupins as green manure; in cucumbers it was increased from 5.7 in the control to 7.1 by the application of peat plus lime; in tomatoes from 21.3 to 25.0 by the application of lupin green manuring plus NPK; and in onions from 7.7 to 8.4 by the application of peat plus lime. The best results were generally obtained with lupin as a green manure; mineral fertilizers plus organics increased the vitamin C content of

* Green parts of the onion are used a great deal in Russian cooking.

cabbage and onion, decreased it in cucumber and had no effect in tomato. Liming with application of peat strikingly increased the vitamin C content in all the vegetables tested. Liming combined with mineral fertilizers also gave good results with all crops except onion. A decrease in vitamin C content resulted only from the combination of liming and lupin green manuring.

785. WALLACE, T.

546.46 : 634/635 : 632.19

Magnesium deficiency of fruit and vegetable crops.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 24-8, bibl. 3.

The soils throughout the world on which magnesium deficiency symptoms have been noted are of the leached, sandy types naturally poor in lime, magnesia and potash. Crops affected include tobacco, cotton, potatoes, cereals, sugar beet, apples, pine trees, citrus and vegetables. There are certain features common to the symptoms. Leaves are very characteristic and always show some of the following points:—Intravascular chlorosis often followed by necrosis; high colourations, generally yellows, reds and purples often with well-defined outline; marginal browning or browning of patches near the centres of the leaves. The symptoms always appear first on the oldest leaves and develop progressively up the shoots to the young foliage at the tips. Affected leaves tend to be shed prematurely and severe defoliation is an outstanding feature. Dwarfing may occur in perennial plants. In tobacco and fruit trees diagnosis of the deficiency can be confirmed by chemical examination on the leaves. Where leaves of healthy plants show a MgO content in the dry matter of the older leaves of 0.4%, affected leaves show less than 0.40% and sometimes as little as 0.20%. Magnesium deficiency can be controlled by soil treatment only, fairly quickly by magnesium sulphate materials such as Epsom salts, calcined kieserite and sulphate of potash-magnesia—the last being two German products—or more slowly by dressings of magnesian limestone. At Long Ashton neither magnesian limestone nor magnesium sulphate dressings up to 5 cwt. per acre of calcined kieserite, produced observable effects until the 2nd season of treatment. Investigations on magnesium deficiency in fruit in England have already been reported by the present author, *J. Pomol.*, 17 : 150-66, 18 : 145-60 and 18 : 261-74; *H.A.*, 9 : 46, 10 : 961 and 10 : 1352. Observations on vegetables have been made over one season only, 1940, and confined to one well-defined case at Long Ashton. In this case of the three vegetable crops grown cauliflower and broccoli proved very susceptible, sprouts slightly so and savoy practically immune.

786. WALLACE, T.

546.711 : 635.1/7 : 632.19

A note on manganese deficiency in agricultural and horticultural crops.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 19-23.

Manganese deficiency symptoms have been noted in England under the following soil conditions : (1) thin peaty soils overlying calcareous subsoils, (2) alluvial soils derived from calcareous materials, (3) poorly drained calcareous soils with high organic content, (4) reclaimed heath soils excessively limed, (5) calcareous soils freshly broken up from old grassland, (6) old black garden soils limed and manured regularly for many years. The two conditions common to all cases are a high content of organic matter and a high lime status with pH over 6.5, the manganese becoming unavailable to certain plants. Observations on horticultural crops in the Bristol area show that much the most susceptible crop is the globe beetroot. In it the affected leaves become abnormally red. Long varieties of beet are much less susceptible. Spinach and spinach beet are very susceptible and show typical leaf mottling. Parsnips show chlorotic leaf mottling, parsley browning of leaf edges, cos lettuce chlorosis and edge scorching of older leaves, onions white streaking of leaves, dwarf and runner beans slight chlorotic leaf mottling and vegetable marrow chlorotic leaf mottling. Apples and raspberries have both shown interveinal leaf chlorosis. In all plants there may be a considerable amount of natural recovery later in the growth season. As regards control good quality farmyard manure will be effective in the year of application, e.g. especially for potatoes and roots. Dressing with finely ground sulphur at from 5 to 20 cwt. per acre gives good results by its acidifying action. Basic slag has given beneficial results on mangolds and sugar beet. Manganese sulphate as fertilizer at the time of sowing at 1 cwt. per acre or as spray or dust at 20-60 lb. per acre has been found good. A case is reported of control in sugar beet by 2 sprayings of 2.5 lb. each of manganese sulphate per acre.

787. CROXALL, H. E., AND OGILVIE, L. 577.15.04 : 631.531.17
The effect of seed dressings containing growth-promoting substances on lettuce, tomato, sugar beet and dwarf bean.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 29-34, bibl. 6.

Seeds of lettuce, tomato, sugar beet and dwarf bean were treated with dressings containing α -naphthalene-acetic acid or a preparation of mixed naphthalidene-acetic acids, the dressings being talc, cuprous oxide and zinc oxide. When talc was the dressing there was no significant effect on crop yield. In one experiment with lettuce seed where cuprous oxide was used alone without any added growth substance the resulting lettuces were less in weight than the controls. Where growth substance was added to this dressing no such diminution in yield occurred. Otherwise under the conditions of the experiment there was no noticeable result from applying growth substances to seed.

788. DOWSON, W. J. 632.3
The identification of the bacteria commonly causing soft rot in plants.

Ann. appl. Biol., 1941, 28 : 102-5, bibl. 16.

Bacterium carotovorum and *B. aroideae* have a wide range of material hosts. *B. phytophthorum* and *B. rhaponticum* appear to be restricted to potato and rhubarb respectively. *Pseudomonas marginalis*, although recorded so far only from lettuce, may be responsible for a certain type of potato rot in soil or storage. The artificial host range is wide except for *B. rhaponticum*. The differentiating biochemical reactions and characters are described and tabulated.

789. KEARNS, H. G. H. 632.78
A note on a *Lonchocarpus nicou* dust for the control of the cabbage white butterfly.

A.R. Long Ashton agric. hort. Res. Stat. 1940, 1941, p. 80.

Successful control of the cabbage white butterfly was achieved with a dust made to the following formula :—*L. nicou* (4% rotenone) $2\frac{1}{2}$ lb., gypsum seconds mineral $92\frac{1}{2}$ lb., amorphous silica dust 5 lb., the *Lonchocarpus* being finely ground so that most of it passed through a sieve of 200 mesh per linear inch.

790. FOULON, L. A. 633.491
El problema economico de la papa. (Potato economics.)
Publ. Inst. Econ. Legisl. rur. Buenos Aires Fac. Agron. Vet., Tome II, 1939, pp. 361, bibl. 93.

This encyclopaedia of the economics of potato production and marketing with special reference to the Argentine will be of considerable value to the student of the statistics of agricultural production. The first 40 pages deal with the plant and its cultivation, its origin and gradual rise to world importance. In the second part of the work the business side of potato production is considered as affecting 3 Argentinian provinces. Next quarantine regulations are considered (pp. 171-94) and the author passes then to consider methods of transport (pp. 194-219). Trade, internal and external, including marketing, storing, etc., is discussed in some detail (pp. 219-326). State regulations are noted (pp. 327-46). Finally the author sums up the position and makes certain suggestions for the reorganization of potato management in the Argentine.

791. BALD, J. G. 633.491
A report on agricultural features of the Australian potato industry.
Pamphl. Coun. sci. industr. Res. Aust. 106, 1941, pp. 72.

The subjects treated are climates of potato-growing areas, soils, agricultural methods, varieties grown in Australia, diseases and pests, certification of seed, breeding.

792. WELLINGTON, R. 633.491
Potato growing in new areas.
Agriculture, Lond., 1941, 47 : 224-8.

The article is written for those who in view of the call for increased potato production are perhaps growing the crop on a large scale for the first time. It is full of practical advice which concerns every phase of potato growing from choice of "seed" to storing the crop.

793. SOARES, C. 633.491
Notas praticas sobre a cultura da batatinha. (**Potato growing in Brazil.**)
Ceres, 1940, 2 : 240-44.

An account of a large potato growing concern in Minas Gerais and of the methods used.

794. C., C. 633.491-1.532.2
La multiplication des pommes de terre. (**Propagating potatoes.**)
Rev. hort. suisse, 1941, 14 : 64-6.

Several methods of propagating potatoes when planting tubers are scarce are noted. 1. The potatoes are cut longitudinally in two, preferably several weeks before the planting. The old method of rubbing the cut portions with some drying substance such as ashes or lime is now discredited. Instead the potatoes are placed in a warm (10-12° C.) humid atmosphere such as a greenhouse and covered with wet sacks. In 24 hours a protective skin will have formed and the sectioned tubers are arranged side by side on trays and exposed to the light till required. Previous sprouting of the tubers in the normal way by exposure to light in a temperature of about 4-5° C. is advised. 2. All the eyes may be cut out with a fair-sized piece of the tuber attached. What remains of the potato can be eaten. These eyed sections are first cicatrized as described above and are then packed on trays, eye upwards, in leaf mould or some similar material. Shelter from the weather together with the admission of light are necessary. Planting should be carried out as soon as possible. 3. Another method is to start the potatoes into growth in heat in January. When the shoots are 2-2½ inches long they are taken with a heel, potted into 3-inch pots, plunged in a propagating pit and repotted into 5-inch pots when well rooted. They are gradually hardened off and planted out in May. 4. A variation of this method is to cut out the dormant eyes, start them in heat and as the shoots develop detach them for cuttings below the first joint. Each eye will produce a succession of shoots which may be treated similarly and a large number of plants raised.

795. RATERA, E. L. 633.491-1.67
Investigaciones sobre sistemas de riego en cultivo de papas. (**Systems of irrigation for potatoes.**)
Mem. ann. Inst. Mec. Hidraul. agric. Buenos Aires 1938, 1939, pp. 7-13.

In parts of the Argentine the potato crop often suffers badly from want of rain. Small scale irrigation experiments were undertaken, the irrigations being superficial and subterranean respectively. For the latter the potatoes were planted on mounds raising them above the level of the water. An increase of 1,092 kilos per hectare was obtained with whole tubers of 50-60 gm. weight irrigated superficially. Subterranean irrigation was comparatively ineffective. The yield was reduced in all cases, including the non-irrigated controls, by the use of cut seed (half and quarter sections).

796. PARRIS, G. K., AND JONES, W. W. 633.491-2.8
Studies on the nature of spindling sprout of potato.
Phytopathology, 1941, 31 : 340-6, bibl. 10.

Spindling sprout of potato is the premature production of thread-like sprouts by tubers, resulting in a considerable reduction of yield by the affected plants. Following investigations reported it is concluded that the condition may be due to an inability of the apical meristems of the buds of the tuber to synthesize proteins for reasons still unknown.

797. BALD, J. G., NORRIS, D. O., AND DICKSON, B. T. 633.491-2.8
The shape and development of potato tubers and their significance in the diagnosis of spindle tuber.
Phytopathology, 1941, 31 : 181-6, bibl. 6.

A virus disease in Australian potatoes variety Up-to-Date (Factor), diagnosed as spindle tuber, causes a decrease in cross-sectional area relative to length in tubers of marketable size. The shape of young tubers is not affected. Several other viroses and a variety of environmental conditions failed to alter tuber shape. [From authors' summary.]

798. SILBERSCHMIDT, K., NOBREGA, N. R., AND KRAMER, M. 633.491-2.8
A identificação das doenças de vírus encontradas nos campos de multiplicação de tuberculos—sementes de batatinha. (*Identification of virus diseases of potato encountered in our seed potato fields.*)
Rev. Agric., S. Paulo, 1941, 16: 23-41, bibl. 10.

Much virus developed in potato plants of the variety Eigenheimer imported from Holland for propagation purposes at the government seed production nursery at Serra da Fartura, Brazil. An account is given of the work leading to the identification of these viruses which were found to belong to the groups X and Y.

799. MARSH, R. W., AND MARTIN, H. 633.491-2.411
Simplified methods of potato blight control (*Phytophthora infestans*).
Progress report I—Spraying methods.
A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 63-75, bibl.
HICKMAN, C. J.
Progress report II—Dusting methods.
A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 76-9, bibl. 1.

In the first trials described an account is given of applying burgundy and bordeaux mixture with a watering can. The bordeaux tended to block the holes of the watering rose but apart from this sprinkling appeared to be quicker and easier than spraying and to ensure adequate cover. The efficacy of results could not be tested in the comparative absence of the disease. The dusting trials were also hampered by the same absence of disease. The dusts used were copper sulphate monohydrate and cuprous oxide. A hand-operated rotary blower proved a much more efficient dust distributor than a home made duster.

800. MANIS, H. C., AND GUNDERSON, H. 633.491-2.7
Principal potato insects of Iowa and their control.
Bull. Ia agric. Exp. Stat. ext. Serv. P18, 1941, bibl. 2.

The insects discussed are the potato leaf hopper (*Empoasca fabae*), the potato flea beetle (*Epitrix cucumeris*) and the Colorado beetle (*Leptinotarsa decemlineata*). Most common potato insects can be controlled by spraying with 4.4.50 bordeaux mixture to which has been added 1 lb. calcium arsenate or paris green. A new and effective dusting method is to mix 100 lb. 325-mesh dusting sulphur with 8 lb. calcium arsenate and apply at the rate of 25 lb. to the acre.

801. ROBINSON, H. G., AND CAMM, J. 635.13
Carrot growing on the farm.
Agriculture, Lond., 1941, 47: 231-5.

Practical directions for carrot growing by the English farmer. The varieties recommended are Early Market and Stump-rooted Intermediate.

802. WELLS, J. G., AND DAVIDSON, J. A. 635.13
Carrots used as a green feed substitute.
Quart. Bull. Mich. agric. Exp. Stat., 1941, 23: 155-8.

Chantenay yellow carrots and presumably any other yellow carrot may be fed to poultry as a source of carotene. The carrots should be cooked without boiling or steamed by use of steam in water to maintain the carotene content.

803. HAWTHORN, L. R. 635.25: 631.8
Onion fertilizer experiments at Laredo, Big Wells, and Eagle Pass, Texas.
Bull. Texas agric. Exp. Stat. 596, 1941, pp. 29, bibl. 8.

The soils involved in these tests were silt, clay and fine sandy loam. Onions responded to fertilizers in general but showed no response in yield to potash. Side dressing of nitrate of soda tended to increase yields but not always economically. Potash had little or no effect on keeping quality. The variety was Yellow Bermuda.

804. SOMERS, L. A. 635.31
Asparagus.
Circ. Ill. agric. Exp. Stat. 507, 1940, pp. 35, bibl. 16.

The planting, care and management of large commercial plantations of asparagus, grown chiefly for canning, in Illinois, U.S.A., is described. The acreage under cultivation in 1939 in this State was 5,800 acres.

805. OGILVIE, L. 635.52

Lettuce growing in the Bristol province.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 35-41, bibl. 15.

Notes on varieties and management of lettuce production in the Bristol area both in the open and in heated houses in spring, winter and summer.

806. LINN, M. B. 632.8 : 635.52 + 635.55

The yellows* disease of lettuce and endive.

Bull. Cornell agric. Exp. Stat. 742, 1940, pp. 33, bibl. 31.

Each of the 23 varieties of lettuce tested proved susceptible to the yellows virus and varietal differences observed in the field seemed due only to preferential feeding on the part of the leaf hopper vector (*Macrostelus divisus*). Characteristic symptoms are yellowing, stunting and twisting of leaves. Appreciable control is obtained by the eradication of weeds within 100 feet of prospective lettuce and endive beds by means of sodium chlorate. Roguing diseased plants was of little value. Dusting with pyrethrum sulphur dust containing at least 0.15% pyrethrins or with 1% rotenone-sulphur dust at weekly intervals from plantation to harvest significantly decreased yellows. Protection of young lettuce plants from hopper in cloth-covered cold frames prior to transplanting gave a considerable reduction of yellows at harvest.

807. WHIPPLE, O. C., AND WALKER, J. C. 632.8 : 635.65

Strains of cucumber mosaic virus pathogenic on bean and pea.

J. agric. Res., 1941, 62 : 27-60, bibl. 41.

Two viruses are discussed, one affecting peas and the other peas and beans in nature. The evidence being that they are related to the cucumber mosaic virus, they are tentatively referred to as strains 14 and 17 of that group.

808. MANN, H. H. 635.655

Soya bean culture in Great Britain.

Nature, 1941, 147 : 660-2, bibl. 5.

Attempts to grow soya bean at Woburn Experimental Station and Rothamsted are discussed. In favourable, that is hot, summers small yields were obtained which did not, however, compare well with those obtained in America. From comparisons between the European Continental mean summer monthly temperature at Kleinwanzleben, where the beans have been successfully grown, and Rothamsted it appears that the English summer fails by only a few degrees to provide the requisite warmth. Other factors which militate against success in England are danger of frosts necessitating late sowing, and wet autumns which interfere with ripening and harvesting. Success seems to depend on the introduction of an early ripening type which will yield more heavily in the English climate than any tried hitherto and will ripen at least by the first week in October.

809. ROSS, W. J. 635.63

Gherkin growing.

Qd agric. J., 1941, 55 : 32-4.

Information on cultivation will be found in abstract 115 of this volume and will not be repeated here. In addition here it is mentioned that gherkins when picked should be placed immediately in a barrel of brine made from 2 lb. of salt to 1 gallon of water. Grading is usually done at the factory. Before sowing the seed should be treated by immersion in one part corrosive sublimate to 1,000 parts water for five minutes, washed in clean water and dried before planting. Close planting in rows helps to keep the ground cool during hot weather. Excess terminal growth should be stopped, especially if the plants are not fruiting. Varieties suitable for pickling are Heinz Early, Boston and Naylor's Smooth. Varieties known as West Indian and wild gherkin are not required. Two acres are as much as could be handled by one man in the picking season.

810. DURELL, W. D. 635.64 : 663.61

The effect of aeration on growth of the tomato in nutrient solution.

Plant Physiol., 1941, 16 : 327-41, bibl. 14.

The tomato variety Louisiana Red was grown in nutrient solution receiving 5 different aeration treatments. Aeration was shown to have a decidedly beneficial effect on the production of

fruit as well as on the vegetative growth of roots, stems and leaves. Of the treatments tried optimum fruit and root production were obtained when the nutrient solution was supplied with 2.5 ml. of air per plant per minute. Plants grown with this amount of aeration gave higher yields than soil grown plants. The fruit of the solution-grown plants was firmer and meatier than that of soil-grown plants but with no difference in flavour. Increasing the aeration above 2.5 up to 250 ml. per minute had no added effect on fruit and root yield but greatly stimulated vegetative growth. The optimum aeration for the latter was probably not reached.

811. HELLER, V. G., HAGEMAN, R. H., AND HARTMAN, E. L. 631.544 : 635.64
Sand culture studies of the use of saline and alkaline waters in greenhouses.
Plant Physiol., 1940, 15 : 727-33, bibl. 7.

Under the conditions used concentrations of either sodium chloride or sodium bicarbonate above 1,400-1,600 parts per million in water supplied to Marglobe tomatoes grown under glass proved extremely toxic.

812. SELMAN, I. W. 635.64 : 632.8
Spotted wilt disease of tomatoes.
Gdnrs' Chron., 1941, 109 : 241-2.

In the course of advisory work by the Cheshunt Research Station an alarming increase in spotted wilt of tomatoes has been encountered, usually in the smaller nurseries growing mixed crops among which are some of the many ornamental plants in which the virus can overwinter. One or more of the following symptoms are exhibited. Stunting invariably; downward curling of leaves just below an apical bud; the surface of the youngest leaves is black or bronzed and glazed or marked with irregular chocolate coloured spots; the older reflexing leaves develop dark spots and later large brown patches of dead tissue; in certain soils the youngest leaves roll inwards so that the purple colour of the veins on the undersurface is exposed. A thrips found frequently in composite plants and in arums and carnations is the insect vector. The virus may be carried on the hands or pruning knife but is apparently not seed borne. Affected tomato plants should be burnt. Thrips should be controlled by a 95-98% nicotine spray, 1 fl. oz. in 10 gal. of water. Where the nature of the plants permits diluted oil emulsion spray, to which is added 8 fl. oz. of nicotine per 100 gal., is very effective. Frequent dusting of flowers harbouring thrips (at 3-5 day intervals) with pyrethrum or nicotine dusts is useful. Nicotine shred or hydrogen cyanide fumigation will greatly reduce the number of thrips.

813. GREEN, D. E. 635.64 : 632.8 + 632.3/4
Hygiene in the war-time vegetable garden VI.
J. roy. hort. Soc., 1941, 66 : 210-4.

Virus diseases of tomato are first discussed briefly under the names mosaic, aucuba mosaic, streak, spotted wilt and miscellaneous. Other tomato troubles dealt with are as follows:—Flower dropping, nearly always due to dryness at the root. Dry set from faulty pollination, which being due to a dry atmosphere can usually be prevented by syringing the foliage in the morning during hot weather. Undue proportion of chaffs or small fruit, due to faulty pollination resulting from overdry atmospheres and cold nights, another cause being dryness at the roots and soft rank growth. Blossom end rot, in which a round blackish area develops at the blossom end of the fruit, is a functional disorder occasioned by water shortage at a critical stage in development of the fruits. Green back, in which the fruit near the stalk end remains hard and green, the actual reason being that the tissues in the shoulder of the fruit are injured through strong sunshine; preventive measures are a supply of potash to the soil and the shading of the glass. Blotchy ripening or the formation of hard green or yellow patches when the rest of the fruit is red; probably this indicates a deficiency of some element and a complete fertilizer should be given; too dry a soil may be a contributory factor. Cracking and splitting occur from dryness at the roots followed by conditions causing quick growth, e.g. watering, nitrogenous feeding or increase in temperature. Scald or the development of a creamy white circular patch having a wrinkled surface comes from excessive sunheat, and can appear on picked fruits placed in sunny windows for ripening. Picked fruit should ripen perfectly in normal warmth without sunlight.

814. SELMAN, I. W. 635.64 : 632.8
The effects of certain mosaic-inducing viruses on the tomato crop under glass.
J. Pomol., 1941, 19 : 107-36, bibl. 22.

Experiments are described in which the effect was examined of tobacco viruses 1 (J. Johnson) and of two strains (A.15 and A.17) of tomato mosaic viruses (Bewley) on the growth, flowering and fruiting of a tomato crop under glass. Plants were artificially inoculated and the results noted. As regards cropping the total yield of ripe fruit from 5 trusses was reduced below that of the control by 22.3%, 20.1% and 14.7% following inoculation by tomato mosaic virus A17, tobacco virus 1 and tomato mosaic virus A15 respectively.

815. WELLMAN, F. L. 635.64 : 632.48
Epinasty of tomato, one of the earliest symptoms of *Fusarium* wilt.
Phytopathology, 1941, 31 : 281-3, bibl. 8.

Epinastic response is shown to be an early and hitherto unreported symptom of *Fusarium* wilt of tomato (*Fusarium bulbigenum* var. *lycopersici*).

816. GLASSCOCK, H. H., AND WARE, W. M. 635.8 : 632.4
Investigations on the invasion of mushroom beds by *Pseudobalsamia microspora*.
Ann. appl. Biol., 1941, 28 : 85-90, bibl. 7.

Evidence is given that the infection of mushroom beds by the fungus *Pseudobalsamia microspora* occurs via the casing soil. An easy method of testing soil for the presence of this truffle was devised. Fresh pure-culture spawn of the white variety of cultivated mushrooms (the most susceptible type) is slightly moistened and placed in the lower half of a glass boiling tube. This is topped with a $\frac{1}{2}$ -inch, slightly moistened layer of the soil to be tested. The tube is plugged and incubated at the optimum temperature of 83° F. If the truffle is present a characteristic cottony growth of cream coloured mycelium will have filled the tube after about 2 weeks. The ascocarps develop freely a few days later. The fungus is very resistant to all forms of disinfection including soil steam sterilization for the normal period. It is, however, sensitive to growing conditions, being retarded by a degree of soil alkalinity tolerated by the mushroom and by temperatures below 52° F. On the other hand unsuitable conditions may merely prevent the appearance of the ascospores. The mycelium would develop unobserved and this might account for numerous past unexplained crop failures. Early attacks can be controlled by the removal of the affected part of the mushroom bed and the spraying of the site with disinfectant, though doubts of the efficacy of the latter treatment, a usual nursery practice, are expressed by some writers quoted. Factors influencing the re-infection of beds are discussed.

817. KEYWORTH, W. G., AND DAVIES, D. L. G. 633.79-2.4 + 2.8
Hop diseases.

Reprinted from *J. Kent Branch N.F.U.*, Dec. 1939 and Feb. 1940, pp. 18.

This reprint contains 3 reports of preliminary investigations carried out in 1938 and 1939 on the following hop diseases:—*Verticillium* wilt, nettlehead, mosaic, split leaf, split leaf blotch and fluffy tip—the cause of the last three being unknown, possibly virus—, *Armillaria* disease, canker due to *Fusarium sambucinum*. The report concerns the chief hop growing districts of England.

818. RAPIN, J. 633.85
Plantes oléagineuses indigènes. (Native oil plants.)
Rev. hort. suisse, 1941, 14 : 40-3, 49-53, reprinted from *Publ. Stat. canton*.
Cult. Phytopath., *Inst. agric. Fribourg*, fr. 0.50.

Detailed instructions are given for the cultivation of the oil-bearing plants, opium poppy (*Papaver somniferum*), colza (*Brassica campestris oleifera*), and rape (*Brassica napus*).

819. ASHBY, M. 633.88
War time drug supplies and Empire production.
Bull. imp. Inst. Lond., 1941, 39 : 1-17, bibl. 27.

The question of the production within the Empire of the many drugs which are in times of peace obtained from foreign countries is considered to be a matter of urgency. Information with a view to assisting the intending Empire grower is given on the cultivation, harvesting and

preparation in the producing countries. The following are briefly dealt with:—chamomile, santonica, caraway, psyllium, cascara, calumba, colchicum, filix-mas, liquorice, ipecacuanha, Chinese rhubarb, squill, valerian, coca, digitalis, ephedra, Egyptian henbane, lobelia, chenopodium, peppermint, thymol, camphor, oil of turpentine, and various gums and seaweeds.

820. SPENCER, E. L. 633.71-2.8
Inhibition of increase and activity of tobacco-mosaic virus under nitrogen-deficient conditions.

Plant Physiol., 1941, **16** : 227-39, bibl. 24.

Turkish tobacco seedlings grown in sand and receiving complete nutrient solution for ten days were inoculated with tobacco mosaic virus. Ten days later one half was deprived of nitrogen in the nutrient solution. In the nitrogen-deficient plants the virus protein content as well as the content of soluble plant protein remained practically constant, whereas in the nitrogen-fed plants each increased more than 5 times in a 16-day period. The biological activity of the virus-protein in the nitrogen-deficient plants decreased more than 40%, though there was no decrease in the virus protein.

821. RATERA, E. L. 633.491 : 581.162.3
Contribucion al estudio del polen de papas. (A contribution to the study of the pollen of cultivated potatoes and of their wild relatives.)
Publ. Inst. Genet. Fac. Agron. Vet., Buenos Aires, Tom. I, Fasc. 4, 1940, pp. 19, bibl. 6.

DURHAM, G. B., SHAW, R. S., AND CHRISTOPHER, E. P. 664.84.21.038
The influence of waxing seed potatoes on loss of weight, yield and starch content.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, pp. 257-9.
 One year's results inconclusive.

- LARGE, E. C. 633.491-2.411
Potato blight.

Agriculture, Lond. 1941, **48** : 22-8, bibl. 6.
 An account of blight and counter measures.

- ALLEN, N., AND HARRISON, P. K. 635.12 : 632.753
The turnip aphid [*Rhopalosiphum pseudobrassicae*] in the southern States and methods for its control.
Fmrs' Bull. Dep. Agric. U.S. 1863, 1941, pp. 9.

- TERRY, H. B. 635.21
Onion growing in the Transvaal.
Fmg S. Afr., 1941, **16** : 90, 110.

- AROEIRA, J. S. 635.21
A cultura da cebola. (Onion growing.)
Ceres, 1941, **2** : 321-36, bibl. 6.
 Onion cultivation in the State of Minas Gerais, Brazil.

- DRUMMOND, O. A. 633.21-2.3/4
Notas sobre as doenças das cebolas e seu combate. (Diseases of onions [in Brazil] and their control.)
Ceres, 1940, **2** : 245-50, bibl. 4.

- DANA, B. F. 581.46 : 635.64 + 635.65
Morphological and anatomical features of phyllody in varieties of tomatoes and beans.
Phytopathology, 1941, **31** : 168-75, bibl. 13.

- DYAS, E. S. 635.655
Soybean production in Iowa.
Bull. Iowa agric. Exp. Stat. ext. Serv. P.30, 1941, pp. 47.

- LLOYD, J. W. 635.655
Range of adaptation of certain varieties of vegetable-type soybeans.
Bull. Ill. agric. Exp. Stat. 471, 1940, pp. 79-100.

- HICKMAN, C. J. 635.656 : 632.4
The prevalence and significance of pea seed infection by *Ascochyta* sp.
A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 50-4, bibl. 2.
- BAWDEN, F. C., AND KASSANIS, B. 633.71-2.8
Some properties of tobacco etch viruses.
Ann. appl. Biol., 1941, 28 : 107-18, bibl. 16.

FLOWER GROWING.

822. BEWLEY, W. F. 635.9 : 635.1/7
Wartime food crops. Subjects for flower growers.
Fruitgrower, 1941, 91 : 399.
823. BRIERLEY, P., AND SMITH, F. F. 635.937.34 : 632.8
Mosaic and streak diseases of rose.
J. agric. Res., 1941, 61 : 625-60, bibl. 25.

The problems of the glasshouse flower grower who wishes to produce food crops as a wartime measure are discussed. The only crops advised by Dr. Bewley are tomato in summer and lettuce in autumn and winter. The paper suggests how to cope with the following. (1) Houses not ideal for tomatoes, (2) sick or unsuitable soil, (3) soil covered with ashes, (4) permanent structures such as pits, etc., which are in the way, (5) unfamiliarity with the details of tomato culture.

824. POST, K. 635.937.36 : 631.454
Effects of mineral-nutrient deficiencies and excesses upon the vegetative growth and flowering of sweet peas.
Bull. Cornell agric. Exp. Stat. 745, 1940, pp. 27, bibl. 32.
- The experiments were conducted with sweet peas grown under glass in winter when hardening, i.e. a condition marked by short internodal spaces, and bud drop are serious problems. The experiments are considered in 3 parts. 1. Reducing and increasing the level of nitrate in soil cultures. 2. Nutrient deficiencies and excesses in sand cultures. 3. Extreme excesses of N, P and K in soil cultures and means of correcting them.

825. JONES, L. K. 635.937.511 : 632.8
Leaf curl and mosaic of geranium.
Bull. Wash. agric. Exp. Stat. 390, 1940, pp. 19, bibl. 14.
- Nearly complete control of mosaic and leaf curl of geranium was obtained by roguing and taking all cuttings from the rogued bed.

826. HARGRAVE, J., AND THOMPSON, F. C. 635.944 : 631.8
The manuring of tulip bulbs.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 7-16, bibl. 12.

The experiments here described have now temporarily been suspended. They included a field experiment in 1938-9 and a forcing experiment in 1939-40. *Field trial*.—All plots received a basal dressing of superphosphate. Treatments were single and double treatments of N and K alone and in all combinations together with control. The layout was 9 randomized blocks, 9 treatments being replicated 9 times. An attack of "fire" led to a high standard error. There are indications, however, that N + K combined produced a moderate increase in bulb weight lifted. *Forcing trial* (in the field). No differences could be discerned as the result of different N and K treatments of forced bulbs.

827. HARGRAVE, J., AND THOMPSON, F. C. 635.944 + 664.84.944
A note on the influence of storage temperature on the growth of the tulip bulb under forcing conditions.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 17-21, bibl. 12.

The chief effect of storage temperature is apparent in the number of early flowers cropped. Earliness of cropping was found to increase, the longer the period in which the bulbs were kept in cool store.

828. HARGRAVE, J., AND THOMPSON, F. C. 635.944 : 631.516
The effect of surface cultivation on bulb weight lifted.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 22-3.

The popular idea that surface cultivation results in increased bulb weight was found to be correct by exact replicated trials.

829. WOOD, J. 635.944 : 632.651.3
Experiments on hot water treatment 1937-39.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 24-33.
General survey of results of investigations on hot water treatment injury of narcissus 1932-1939.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 34-42, bibl. 6.

In the first article the author discusses briefly experiments at Kirton on the following questions:—early lifting and its relation to the duration of susceptibility to flower splitting (King Alfred daffodils) by hot water treatment (H.W.T.); late lifting and its relation to the duration of susceptibility to flower injury (King Alfred daffodils) by H.W.T.; date of planting in relation to the susceptibility of bulbs (King Alfred daffodils) to H.W.T.; influence of pre-H.W.T. storage temperature of dry bulbs (King Alfred daffodils) in relation to H.W.T. injury; influence of pre-H.W.T. storage temperature of dry bulbs (*Poeticus narcissus*) on blindness; storage temperature of dry bulbs (Golden Spur) in relation to H.W.T. injury.

In the second he surveys the results of work at Kirton and elsewhere on the problems connected with hot water treatment. Among conclusions reached are the following:—The customary method of storing narcissus bulbs is suitable if stocks are healthy or if they can be hot-water treated and replanted about 6 weeks after being lifted. Trumpet varieties treated earlier than 6 weeks from the time of lifting may have split flowers. It is only slightly minimized by pre-hot water treatment storage at 80° F. After about 6 weeks of ordinary storage before hot water treatment, susceptibility to general injury increases. It can be influenced by storage temperatures. Assuming the ordinary storage temperature to be 60° F., a lower temperature will increase susceptibility while a higher temperature will decrease it. Decrease in susceptibility results when bulbs are stored at 80° F. for 4 weeks immediately preceding the time of hot water treatment. A shorter period is less effective, while a longer period retards growth. Flowering is only slightly delayed but the flower stalks at flowering time are short. The method of storing bulbs to prepare them for some subsequent treatment is referred to as conditioning them. Narcissus bulbs conditioned for hot water treatment are less susceptible to treatment injury and also to the injurious effects of both heat and cold to which they may be exposed immediately after hot water treatment. [From author's summary.]

830. WALLACE, E. R. 635.944 : 632.651.3
Use of disinfectants in the hot water treatment of narcissus, 1936-38.
Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 43-56.

The author describes experiments in which different pre- and post-treatment storage temperatures were used and different strengths of formalin ranging from 1/100 to 1/400 were used in the hot water. Lately advice to growers has been (1) to make use of higher temperature storage before hot water treatment, (2) to plant as soon as possible after treatment, (3) to use 1/400 formalin in the tank. In view of the trials described here these recommendations now need slight qualification.

831. HORTON, D. E. 635.944

The effect of storage temperature on the flowering of tulips.

Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 70-1.

The effect of storage temperature on Clara Butt tulips was tested. All bulbs were planted on 15 October. The treatments and results were as follows:—(1) Cool storage at 46°-48° F. from 20 August to 15 October, flowering period 26 April-9 May, 97% being marketable flowers; (2) cool storage as in (1) from 14 September to 15 October, flowering period 30 April-11 May, 97% being marketable; (3) storage in general warehouse, flowering period 4 May-14 May, 97% being marketable; (4) warm storage at 72° F. from 20 August to 15 October, flowering period 10 May-17 May, 92% being marketable; (5) warm storage at 72° F. from 20 August to 15 October, flowering period 17 May-29 May, 70% being marketable.

832. HORTON, D. E. 635.944 : 632.19

Observations on the growth of "breeders" in narcissus.

Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 72-3.

As the result of trials the recommendation is made that, to prevent deterioration of stock when cleaning and grading bulbs, bulbs with numerous elongated offsets or with offsets produced all round the parent bulbs should be discarded and destroyed.

833. HORTON, D. E. 635.944

A note on colour in Cornish and Lincolnshire grown narcissus.

Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, p. 74.

The colour of narcissus, especially of the more brightly coloured cup varieties, is deeper and richer when grown in Cornwall than when grown in Lincolnshire. Experiments with the addition of chemicals to the soil having failed to give any result, comparative trials in both districts suggest that local climatic conditions are probably responsible and it is thought that the moister air of Cornwall prevents the fading noticeable in Lincolnshire-grown flowers.

834. BEAUMONT, A., AND STANILAND, L. N. 635.944 : 632.654.1

The spread of eelworm in commercial narcissus plantings.

Ann. appl. Biol., 1941, 28 : 135-41, bibl. 6.

Eelworm (*Anguillulina dipsaci* Kühn) is now widely distributed—the spread in narcissus plantings being achieved (a) in surface drainage water, (b) in soil on tools and boots, (c) dried eelworm in dead leaves, especially those moved about the fields by cross harrowing. Leaves can become infected from January to May. If any part of a field becomes infected the bulbs in the whole field should, if possible, be lifted and given hot water treatment while the infected patches should be dug out completely and surrounded by a trench. Infected fields cannot be safely replanted within 3 years after the bulbs have been lifted, and all volunteer plants appearing in the interim must be promptly removed. Official field inspections are of great value to the grower but certificates guaranteeing freedom of stocks from eelworm infection could not safely be based on such inspections.

835. TOMPKINS, C. M., AND HANSEN, H. N. 635.944 : 632.4

Tulip anthracnose.

J. agric. Res., 1941, 62 : 61-4, bibl. 5.

The name *Gloeosporium thumenii* Sacc. f. *tulipae* f.n. is proposed for an anthracnose affecting Darwin tulips Rev. H. Ewbank and Zwanenburg at Burlingame, California. Clara Butt and Fantasy appear to be immune in field and greenhouse.

836. HORTON, D. E. 635.944

Kirton collection of newer varieties of narcissus 1936-39.

Report on bulb experiments, agric. Inst. exp. Stat. Kirton, 7, 1940, pp. 57-69.

TAYLOR, R. E.

635.9 : 632.4

A wilt disease of godetias and other ornamental plants.

Ann. appl. Biol., 1941, 28 : 91-101, bibl. 11.

CITRUS AND SUB-TROPICALS.

837. BARNETT, W. L'E., AND OTHERS. 634.3
Symposium on what constitutes quality in citrus fruits.
Proc. Fla St. hort. Soc. for 1940, 1940, pp. 90-111.

From the legal, marketing, shipping, health and cultural standpoints.

838. OWEN, R. C. 634.3
Citrus growing in Western Australia.
J. Dep. Agric. W. Aust., 1940, 17: 445-62.

Orange production ranks only second to apple growing in the fresh-fruit industries of Western Australia. In this article an account is given of the best methods of cultivation under local conditions, special attention being paid to the economic aspect, or, to quote the author, to making the orchard keep the grower and not the grower the orchard.

839. HARDING, P. L. 634.31-1.541.11
Seasonal changes in the principal varieties of Florida oranges.
Proc. Fla St. hort. Soc. for 1940, 1940, pp. 78-86.

The tables given not only show the seasonal changes in the quantity and quality of juice in Parson Brown, Valencia and other oranges but also the influence of rootstock, sour orange or rough lemon, on these changes. Thus in Parson Brown and Valencia fruit contained higher acidities and higher total solids in juice when grown on sour orange than on rough lemon. Valencia oranges grown on sour orange and sweet orange, grapefruit and Cleopatra rootstocks had more juice than those grown on rough lemon, especially in the case of young trees. Again Valencia oranges were more deeply coloured when grown on sour orange than when grown on Cleopatra, sweet orange, grapefruit or rough lemon. Parson Brown and Valencia oranges were heavier and larger from trees grown on rough lemon than from those grown on sour orange.

840. ROKACH, I. 634.3
Palestine citrus industry in the test of war.
Hadar, 1941, 14: 3-5.

Owing to the difficult times through which the Palestine citrus growers are passing it is suggested that all groves in bad condition should be completely abandoned to cut further loss since there is no hope of their ultimate survival. Bad patches in a good grove should be uprooted and planted with another crop. All good groves should continue to be properly cared for so that advantage may be taken of the good prices that the author considers will be paid for the fruit for the first 3 or 4 seasons after the war before the neglected groves are able to re-establish themselves. Government assistance so far afforded is held to be insufficient because the grower still has to pay something out of his own pocket to maintain the grove. Mortgage holders are advised to assist the mortgagees in their own interest. Restriction of new plantings now and after the war should be enforced, both to encourage present owners to maintain their groves and because, if it is not done, in 5-6 years after the cessation of hostilities there will again be over-production.

841. DE LEON, J. 634.3
Condition of Jewish citrus groves.
Hadar, 1941, 14: 7-9.

The notes concern observations made during inspection of citrus groves in Palestine carried out in connexion with the Citrus Loan for 1940-41. They are interesting as showing the effect on those groves which, owing to lack of means or inclination on the part of the owners, have not received to the full the customary cultural attention.

842. HADAR. (OPPENHEIMER, H. R., Editor.) 634.3-1.556.1
Is the picking of citrus fruit indispensable under present conditions?
Hadar, 1941, 14: 11-3.

The problem discussed by leading Palestine horticultural scientists and growers is whether it is preferable to remove from the trees citrus fruit for which, owing to the war, there is no market or to leave them on the trees until they drop which may not be till after the setting of the new crop. The removal of the crop would entail heavy expenditure which the growers at present are unable to bear. Dr. H. R. Oppenheimer of Rehovot Research Station says that the trees

will not suffer physiologically in the sense that the fruit, if left, will withdraw any appreciable amount of nutrients but there is a grave risk of the propagation of fungus and insect pests. The fruit should be buried at the foot of the trees in the irrigation basins though not quite at the base of the crown. Experiments have shown that such fruit if halved by the hoe and covered with soil to which lime and superphosphate have been added will decompose in a few weeks and prove of considerable manurial value, the reasons for which are explained. The seven other writers all agree that leaving the fruit will not harm the tree and all but one suggest that in view of the risk of disease and the manurial value of the fruit it should be treated as suggested by Dr. Oppenheimer.

843. HARDING, P. L., AND WINSTON, J. R. 634.31 : 577.16

The ascorbic acid (vitamin C) content of juice of the principal varieties of Florida oranges.

Proc. Fla. hort. Soc. for 1939, 1939, pp. 90-5.

The oranges concerned included early and mid-season varieties as well as Valencia on a number of different rootstocks. They were found to have as high ascorbic acid content as Valencia. In Valencia a gradual decrease in vitamin C content was noted with ripening. Over-mature fruit had the smallest content. Usually smaller quantities were found when oranges were grown on rough lemon than when grown on sour orange, grapefruit, sweet orange and Cleopatra rootstock, on which there was little variation. Higher values were found in oranges well exposed to the sun.

844. HERRERO (EGAÑA), M., AND ACERETE (LAVILLA), A. 634.3 : 581.49

Los estomas de los frutos del género citrus. (Stomata of citrus fruit.)

Bol. Inst. nac. Invest. agron. for. Madrid, 1941, No. 4, pp. 121-7, bibl. 3.

The average density of the stomata of 4 species and 9 varieties of citrus was recorded. The number of stomata per sq. mm. was greatest in Marsh Seedless grapefruit and least in Clementine mandarin. Late varieties had a greater number of stomata per mm. than early varieties. There was no apparent correlation between the density of the stomata in the fruit and that of the leaves in the species and varieties examined.

845. HERRERO (EGAÑA), M., AND ACERETE (LAVILLA), A. 634.3 : 581.145

Nota sobre la constitución epidérmica de las hojas del género *Citrus*. (Notes on the structure of the epidermis in citrus leaves.)

Bol. Inst. nac. Invest. agron. for. Madrid, 1941, No. 4, pp. 113-9, bibl. 5.

Such differences as there are in the structure and arrangement of the epidermal cells between the species and varieties of citrus are both slight and inconstant. The number of stomata per sq. mm. in the 9 varieties reported on is least in Cadena fina and greatest in the common lemon. With the exception of Washington Navel the earlier the variety, the less the density of the stomata.

846. COOPER, W. C. 634.3 : 577.15.04

Rooting citrus cuttings with synthetic growth substances.

Proc. Fla. St. hort. Soc. for. 1940, 1940, pp. 174-7, bibl. 4.

Results are given of the treatment with 0.02% solution of indoleacetic acid of cuttings of a large number of citrus varieties. In every case treatment increased the number of roots as compared with untreated cuttings. The largest number of roots was obtained on limes, lemons and shaddock, which also rooted well without treatment. The treatment was quite effective on grapefruit, sweet orange and tangelo, producing 2 to 6 roots per cutting on 70 to 80% of the treated cuttings, untreated cuttings showing very few roots. Mandarins had the lowest percentage of rooted cuttings, possibly owing to the high percentage of spindly, angular stems used. Treated lime and lemon cuttings were usually well rooted after about 60 days in the frames, while treated sweet orange, grapefruit and mandarin cuttings generally took about 40 days to develop a root system large enough to allow of transplanting. Naphthylacetic acid and naphthyl acetamide were effective in more dilute concentrations, i.e. 0.01%.

847. ROBINSON, T. R. 631.541.11 : 634.3

Rootstocks for tangelos and other citrus hybrids, and fruit seed content.

Proc. Fla. hort. Soc. for 1940, 1940, pp. 195-9, bibl. 4.

The superiority of Cleopatra over sour orange as a stock for tangelo and other citrus hybrids in Florida is demonstrated, trees on Cleopatra showing a 40% increase of bearing surface over

those on sour orange. Cleopatra is recommended as a stock in sandy, well-drained soils ; for low moist soils the sour orange is probably more suitable. Rough lemon is unsuitable as a stock for the tangelo and some other hybrid citrus groups. The low seed content of tangelo varieties is not influenced by stock and is still further reduced by monoclonal planting.

848. FRIEND, W. H., AND YARNELL, S. M. 634.323-1.541.44 : 575.252

Clonal selection of grapefruit with respect to yield.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 358-62, bibl. 5.

In recent work by the staff of the Texas Agricultural Experiment Station seven pairs of selections of grapefruit for high and low yield budded, with two exceptions, on sour orange gave approximately equal yields. From this it is concluded that the use of budwood from normally vigorous trees of specially low or specially high productivity is unlikely to result in inferior or superior productivity respectively.

849. EL AZOUNI, M. M., AND CAMERON, S. H. 634.3 : 581.14

Adventitious buds in citrus.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 363-7, bibl. 11.

Indoleacetic acid did not stimulate the regeneration of adventitious buds in citrus which can take place from the callus tissue covering the wound surface of disbudded citrus seedlings. The regeneration was apparently stimulated by the use of asphaltum paint. Regeneration was particularly noticeable in sour orange and lemon seedlings.

850. DEL CAMPO GAMIO, J. M. 634.3-1.541.11

Como llegar a una producción individual uniforme en los montes citricos.

(How to obtain uniform yields in citrus plantations.)

Rev. Fac. Agron. Uruguay, 1940, No. 22, pp. 107-44, bibl. 5.

This paper discusses rootstock selection of polyembryonic seedlings of sour and trifoliate orange. The methods for doing this effectively are described, and follow the lines originally suggested by Webber. The author has applied the methods to large numbers of seedlings and gives an account of his work and of the results obtained.

851. SHERWOOD, H. M. 631.532/5 : 634.441 + 634.3

Experiences in the propagation of some sub-tropical fruits.

Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 169-72.

T shield budding the mango in Florida.—The stock should be starting to flush ; the bud should be inserted when the bark is green and is of approximately the same diameter as the shield. The bud should be just breaking ; fully developed primary wood is better than secondary ; the wood is carefully removed from the back of the bud shield ; when inserted it should be allowed to split its way for $\frac{1}{4}$ - $\frac{1}{2}$ inch beyond the knife cut, which tends to hold the bud shield tighter to the stock. Wrap from below spirally upwards, missing the bud and continuing above it ; the bud is then covered loosely with another strip of tape which is removed in from 10 days to 3 weeks, the holding tie being left on for considerably longer ; turpentine added to the beeswax in which the tape is treated, $\frac{1}{2}$ pint to 3 lb. of wax, will make it stick better. Staking is important and the new bud shoot may have to be directed upwards, otherwise it may grow straight out from the stock for 6 inches or so. *Perrine lemons.*—The Perrine lemon grows rankly on rough lemon so that bark splitting and diseases entering through bruises are common. This growth was controlled by withholding fertilizers but providing a constant supply of adequate moisture. Trees so treated are in far better condition than those receiving fertilizer and less moisture. Persian limes will assimilate large quantities of fertilizer but an even supply of moisture in addition has greatly improved the trees and eliminated all gumming.

852. SOKOLSKAYA, B. P. 634.3 : 581.163

A new method of obtaining parthenocarpic fruits in citrus. [Russian.]

Soviet Subtropics, 1940, No. 10, pp. 36-9.

In two-years' studies on the polyembryony of citrus, carried out in southern U.S.S.R., parthenocarpic fruits of oranges, tangerines, lemons, and grapefruit were obtained by the following method. By pressing gently on the top of the bud that is likely to open on the following day, the style of the pistil is broken off at the junction with the ovary. The flowers are thinned out

so as to leave only 10 to 15% of the total number on the tree at more or less regular distances of 5 to 7 cm. apart. All trees thus treated were found to give increased yields; thus of the two trees of Smyrna orange both having an equal percentage of flowers left on them, the treated tree gave 132 fruits more than the control, in the Malta orange the treated gave 60 fruits more than the control and that of the Blidach orange 251 fruits more than the control. Of the two tangerine trees the treated tree gave 298 fruits more than the control. The fruits of the experimental trees were sweeter than those of the controls and generally superior to them in taste. Biochemical analysis of fruits from these trees showed that they possessed a higher content of vitamin C and sugar and less acid. The average weight of 10 experimental fruits was higher than that of 10 control fruits (114.8 as against 105.5, 131.7 as against 125.7, 82.9 as against 74.5, and 80.7 as against 72.0 gm.). Fruits from experimental trees were all seedless. This method is considered to be superior to the usual methods of castration, as producing larger fruits and being generally simpler.

853. MILLER, E. V., AND WINSTON, J. R. 634.31 : 581.192 : 547.313.2

Investigation on the development of color in citrus fruits.

Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 87-90.

Results of experiments may be summarized as follows:—(1) Colour in orange rinds is produced by two groups of ether-soluble pigments—chlorophylls (green) and carotenoids (yellow). (2) Degreening on the tree results in a loss of chlorophylls and an increase in carotenoids in the rind. (3) Ethylene degreening removes the chlorophyll without affecting the carotenoids. (4) Limes, lemons and grapefruit differ from oranges in that carotenoid pigments tend to decrease along with chlorophyll when they degreen, whether this takes place on the tree or as the result of ethylene. (5) When oranges are degreened with ethylene it is impossible to bring out any more carotenoid pigment than is present at the beginning of the process. [From authors' summary.]

854. HODGSON, R. W., CAMERON, S. H., AND EGGERS, E. R. 634.31-1.542.27

Effect of time and amount of harvesting on alternate bearing and fruit size in the Valencia orange.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 196-201, bibl. 6.

In Southern California the Valencia orange shows marked biennial bearing. Early harvesting and fruit thinning tend to reduce the depressing effect on tree growth in the current year and ensuing crop caused by the heavy crop borne in the on-year.

855. HILGEMAN, R. H. 634.323-1.547.6

Studies of the ripening of Marsh grapefruit in Arizona with special reference to the improvement of maturity measurements.

Tech. Bull. Ariz. agric. Exp. Stat. 89, 1941, pp. 168, bibl. 21.

The regulations at present governing the export of Arizona grapefruit are not entirely satisfactory. The objects of the investigations reported here have been fourfold. (1) *To evaluate the factors influencing the accuracy of measurement of physical and chemical values.* Data indicate that large fruits tend to have a higher Brix : acid ratio and percentage of peel and a smaller percentage of juice by volume than small fruits. Outside fruits were typically higher in Brix : acid ratio and lower in juice percentage than inside fruits. The percentage of juice by weight and volume based on whole fruit is higher after ethylene treatment. (2) *To study physical and chemical changes in the fruit during ripening.* Observations show that neither extent of coloration nor the colour of the juice are in themselves adequate as a measure of maturity. Total soluble solids (Brix) increased gradually up to midwinter and decreased in the spring. The Brix : acid ratio increased with maturity but its numerical value was not in itself an adequate measure of maturity. Juiciness increased to a maximum in December but again did not adequately express maturity. Changes in percentage of peel and of rag were noted. (3) *To interpret the data with respect to improving existing maturity standards.* There are strong indications that no definite fixed standards applicable every year and in all circumstances will be satisfactory. (4) *To evaluate the influence of cultural and environmental factors on maturity.* The summation of heat required to attain a 6 : 3 : 1 Brix : acid ratio averaged 5,930 units. Irrigation in the fall appeared to have no immediate effect upon the total soluble solids : acid ratio. The application of nitrogenous fertilizers in February tended to produce fruit with a lower acid and

higher Brix : acid ratio than no fertilizer or manure. A high vegetative condition of the trees throughout the year tended to produce fruit with a low Brix and a relatively high acid percentage and to retard the rate of increase in their ratio as the fruit matured. It tended to increase the percentage of juice in the peeled fruit and retard the rate of coloration. A combination of high vegetative condition in winter and low in summer tended to give fruit with a fairly high Brix and low acid, a high Brix : acid ratio, an average percentage of juice in the edible portion and an intermediate rate of coloration.

856. SEMYAKIN, K. S., AND MOROZ, E. S. 634.3-2.111-1.8
The effect of mineral fertilizers on the frost hardiness of citrus plants. [Russian.]
Soviet Subtropics, 1940, No. 10, pp. 19-21.

From the results of two sets of experiments conducted at the Sukhum Botanical Gardens [Caucasus] during 1937/38, it is concluded that citrus frost-hardiness can be increased by the application of mineral fertilizers. In the first set of experiments, conducted at temperatures of 8·5° and 10° C., grapefruit was shown to have harder stems than leaves. Its general hardiness was increased by the application of KCl in spring plus NH_4NO_3 in autumn or of complete fertilizer applied as a mixture $\text{NaNO}_3 + \text{KH}_2\text{PO}_4 + \text{Na}_2\text{HPO}_4$ (at the following rates, N—0·15, K—0·1 and P—0·2 g. per 1 kg. of absolutely dry soil) in spring, supplemented in autumn by NH_4NO_3 . Complete fertilizer applied at higher rates had a decidedly harmful effect upon the leaves and stems of grapefruit. In the second lot of experiments with Italian tangerine conducted at temperatures of 6° and 7·5°, the fertilizers were applied in liquid form. The most beneficial effects with regard to hardiness were obtained by the application of NH_4NO_3 , the combination of KCl and NH_4NO_3 being good but less beneficial, while KCl alone had a negative influence. It is concluded from these results that by working out the best form, rate and date of application of fertilizers here shown to have a beneficial effect, the hardiness of citrus can be effectively increased.

857. LAWLESS, W. W., AND CAMP, A. F. 634.3-2.111
Preliminary reports on varieties and other factors as influencing cold resistance in citrus.
Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 120-5.

Deductions from observations on the results of cold spells especially those in 1927, 1934 and 1940. *Rootstocks*.—Where sour orange had resulted in a top of less vigour than that produced by rough lemon under comparable conditions, cold damage was greater on the sour orange tree, whereas, provided the tops were all in good condition, fruit from trees on sour orange was more resistant to cold than on rough lemon, probably owing to the higher concentration of sugars in the juice of the former fruit and its greater firmness. *Varieties*.—As regards tree damage tangerines were least damaged by cold. Marsh Seedless came next followed by a large group of oranges including Valencias, Parson Browns and Lue Gim Gongs. These were followed by seedy grapefruit varieties, their susceptibility varying directly with the number of seeds per fruit. Pineapple oranges suffered the worst. *Fertilizers*.—No differences were found which could be traced directly to N, P or K, possibly because no trees approached the stage of acute deficiency in any of these elements. The indications from the Citrus Experiment Station grounds at Lake Alfred are in general that any deficiency is likely to predispose trees to cold injury and that Cu and Mg are particularly important in this connexion.

858. KOUKSENKOK, A. 634.334-2.111
Topworking lemons on tangerines. [Russian.]
Soviet Subtropics, 1940, No. 9, p. 29.
 GOGVADZE, I. I. 634.334-2.111
More on topworking lemons on tangerines. [Russian.]
Soviet Subtropics, 1940, No. 9, p. 30.

In Sotchi [Caucasus] in the autumn of 1937 lemon buds were inserted into the crown of 8-year-old tangerines; they became well established in several cases and two trees formed a well-developed lemon crown, the first fruit being produced in 1939. During the severe winter of 1939/40, when frosts lasted for over 30 hours and the temperatures dropped to -8·5° C., several lemon trees perished and tangerine trees suffered severe damage, but the lemons grafted on to the crown of

tangerines survived the frosts with leaves and wood intact. This indicates the possibility of avoiding frost damage and facilitating the growth of lemons in the northern parts of the subtropics.

Gogvadze points out that in topworking lemons on tangerines, care must be taken so to place the scion as to afford it maximum cold protection by the stock. Later on the shoots of the scion should be pruned and bent towards the sheltered side so that at no time would the lemon branches grow higher and beyond the branches of the tangerine. This pruning will also accelerate and increase fruiting. During the winter the branches of the tangerine might be tied over the lemon crown like a hood. This method gave very good results on a farm of the Limman Trest in Georgia [Caucasus] where 40 seven-year-old tangerines budded with lemon withstood the severe winter of 1939/40 and gave a certain amount of flower in 1940, while three-year-old lemon trees on the same plot covered with bamboo lost 70 to 80% of their leaves.

859. O'BYRNE, F. M., AND OTHERS. 634.3-2.111

Symposium on the protection of groves against cold by firing.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 126-34.

Four articles giving the results of practical experience in the citrus orchard with wood, coke and oil heating.

860. ROY, W. R., AND BAHRT, G. M. 634.31-2.19 : 577.16

The effect of zinc, iron, manganese and magnesium applied to frenched and bronzed orange groves on the vitamin C content of oranges.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 34-8, bibl. 5.

The addition of zinc and magnesium salts to orange trees showing signs of frenching and bronzing resulted in a restoration of the normal vitamin C content in the juice of the oranges from these trees. When, however, these elements and also boron, barium, manganese and iron were added to the soil, in which unaffected trees with apparently normal foliage were growing, no increase in the vitamin C of the fruits could be found. A certain lag was noticeable in the effect of the treatments, little of which could be seen in the year of application.

861. BAHRT, G. M., AND ROY, W. R. 634.31-1.83

Progress report of the effects of no potassium and various sources and amounts of potassium on citrus.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 26-34. [N.B.—Paging in wrong order in abstractor's copy.]

In an experiment started on Norfolk fine sand in 1934 on Valencia orange trees planted in 1924 and manured similarly up to the start of the experiment the trees which received no potash matured their fruits earlier. The percentage of total solids in the juice was higher and the total acidity lower than in oranges to which potash had been given. The yields were less and the fruit was smaller. The number of leaves decreased and the trees were not thrifty. Trees receiving the chloride gave higher yields and bigger fruit than those receiving the sulphate or potassium magnesium sulphate. In trials with Parson Brown oranges the application of potash in the fall only gave earlier maturing fruit than when it was applied in the spring, summer and fall. The size and yield was not materially affected, but the application in the fall only resulted in juice of less acidity and less total solids.

862. FUDGE, B. R., AND FEHMERLING, G. B. 634.31 : 581.192 : 631.4 + 631.8

Some effects of soils and fertilizers on fruit composition.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 38-46.

The authors give tables showing (1) the effect of rootstock, i.e. sour orange and rough lemon, on fruit composition in Parson Brown, Pineapple, Valencia and Duncan, (2) the effect of soil composition, i.e. heavy Hammock and light Norfolk soil, on juice composition and (3) the effect of minor elements on the maturity of Pineapple oranges. They come to the conclusion that in the heavy soil areas soils and rootstocks are of major importance, whereas on the lighter soils the use of fertilizers, properly balanced and containing the minor elements, is more essential. In many groves magnesium is particularly important.

863. HUBBELL, W. W. 634.3-1.8-2.19

The place of nutritional sprays in the spray problem.

Proc. Fla St. hort. Soc. 1939, 1939, pp. 100-4.

A general discussion on the advantages of the addition by spraying in different forms of zinc, copper and manganese. It is noted that experiments are also being carried out with encouraging results on iron, barium, boron and nickel deficiencies.

864. DODGE, E. M. 634.3-2.8

Sealybark or psorosis of citrus trees in South Africa.

Sci. Bull. Dep. Agric. S. Afr. 208, 1939, pp. 31, bibl. 22, being Plant Industry Series 54.

The author gives a clear account, supported by excellent illustrations, of the incidence of psorosis in S. Africa. He also notes certain obscure bark diseases which might be confused with it. He considers that the urgent need is for some method of detecting the presence of psorosis in trees apparently sound to which the disease has been transmitted at the time of budding and in which it is latent. If, as supposed, it is a virus, methods which might possibly determine this point are available. Once certainty could be obtained as to whether a seemingly healthy tree was infected or not, the danger of taking buds from infected trees could be thus eliminated.

865. WAGER, V. A. 634.31-2.19 + 2.4

The November-drop and navel-end-rot problems of navel oranges.

Fmg S. Afr., 1941, 16 : 143-4.

This paper is a summarized version of Science Bulletins 192 and 193 of the Union Department of Agriculture. For abstract of this and of version given in *Citrus Grower*, 1940, No. 81, see *H.A.*, 11 : 154.

866. SACCÁ, R. A. 632.42 : 634.31

Sobre a forma ascofóra (*Glomerella* sp.) que encontrei em algumas folhas de laranja doce no Guarujá. (On an ascophore (*Glomerella* sp.) met with on the leaves of sweet orange.)

Rev. Agric. S. Paulo, 1940, 15 : 463-7, bibl. 5.

The ascophores of an unrecognized *Glomerella* sp. have been found infecting sweet orange in Guarujá, Brazil. Its possible identity is discussed and the symptoms and injury caused are described. Badly attacked branches should be removed and burnt. The trees should be sprayed with bordeaux mixture and the soil receive a good dressing of organic manure with some added phosphates and if possible be limed.

867. THULLBERRY, H. A. 634.3-2.4

Melanose and its control.

Proc. Fla St. hort. Soc. 1939, 1939, pp. 112-3, bibl. 3.

The results of applying 4 different treatments to 9 groves in all showed that the best monetary returns were received when melanose-infected groves were not only pruned but also sprayed with a mixture of approximately 16 gallons per 20-year-old tree made of 2 lb. neutral copper, 2 lb. zinc sulphate, 1 lb. hydrated lime, 10 lb. wettable sulphur containing 90% sulphur and a good wetting agent. Pruning without spraying was valuable but not so profitable as one spray application. Spray dates depend of course on weather, cultural practice and blooming period.

868. THOMPSON, W. L. 632.73 : 634.3

Thrips attacking citrus fruits in Florida.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 56-61, bibl. 5.

The damage done in Florida by the following thrips is discussed :—*Frankliniella cephalica bispinosa*, known as the Florida Flower thrips; *Chaetothrips orchidii*; *Heliothrips haemorrhoidalis*, or greenhouse thrips.

869. SMITH, A. J. 634.3-2.73

Tartar emetic for the control of citrus thrips.

Fmg S. Afr., 1941, 16 : 80.

Tartar emetic for the control of citrus thrips in S. Africa has given encouraging results in the laboratory. The preparation has the advantage of acting as a bait so that complete coverage

of the tree is not so essential as in a contact spray, nor is a high pressure pump necessary, an ordinary stirrup pump sufficing. The time to spray is at 75-100% petal fall and again 10 days later. Three-four gallons of the solution should be used for each tree. The formula is tartar emetic 1 lb., granulated sugar 2 lb., water 100 gal.

870. MILLER, R. L. 634.3-2.111-2.6/7

The status of citrus pests following the recent cold.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 64-7, bibl. 67.

THOMPSON, W. L.

The status of citrus pests following the recent cold.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 67-72.

Practically all citrus insects, both injurious and beneficial, survived a particularly cold spell in January 1940.

The second author considers individual pests in detail.

871. HAYWARD, K. J. 634.1/7-2.77-2.961

Lucha biologica contra las moscas de las frutas. (Biological control of fruit flies.)

Circ. Est. exp. Agric. Tucuman 95, 1940, pp. 6.

Instructions are given for making a covering to the pits in which fruit attacked by fruit fly is thrown, so designed as to retain the hatching fruit fly while allowing the parasites to escape.

872. HALMA, F. F. 634.3 : 581.13

Comparative study of initial and subsequent size of citrus cuttings and budlings.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 336-8, bibl. 2.

RHODES, A. S. 634.3-2.8

Further light on the nature and cause of psorosis of citrus trees.

Proc. Fla St. hort. Soc. 1939, 1939, pp. 118-20, bibl. 6.

SACCÁ, R. A. 634.31-2.4

Pustulas pretas sobre laranjas doces produzidas pelo *Phoma citricarpa*.

(*Phoma citricarpa* black spot of sweet orange.)

Rev. Agric. S. Paulo, 1940, 15 : 468-74.

NAUDE, C. P. 634.31-2.48

Removal of sooty blotch from oranges.

Fmg S. Afr., 1941, 16 : 103.

VOORHEES, R. K. 634.3-2.111-2.4

The status of the melanose fungus in cold-injured citrus wood.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 61-4.

THOMPSON, W. L. 634.3-2.752

Factors influencing the development and control of scale insects on citrus.

Proc. Fla St. hort. Soc. 1939, 1939, pp. 104-10, bibl. 6.

MEAD, S. V. 634.3 : 581.192 : 613.2

Some nutritional, medicinal and bactericidal aspects of citrus fruits.

Proc. Fla St. hort. Soc. 1939, 1939, pp. 132-8, bibl. 5.

873. FRANCE, J. G. 634.653 + 634.337

A correspondence survey of the Florida avocado and lime industries.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 55-61.

This paper consists of excerpts from letters and one entire letter from H. S. Wolfe, Head of the Department of Horticulture, Gainesville, Fla. Among the points made by Wolfe are the following:—Avocado has increased considerably in Central Florida during the last 3 years. New plantings have mostly been West Indian × Guatemalan hybrids of late autumn and winter season or Guatemalan varieties of the same season. The hybrids, unlike the West Indians, were little damaged by the cold in the past winter. The handicaps of the industry are competition from Cuba in West Indian avocados and inability to co-operate. As regards Persian limes there has lately been a boom followed by decreased plantings. Handicaps here are the shipment of Mexican limes from California, shipment of poor quality limes by certain Florida growers; and

the lime bark disease or gummosis caused by *Diplodia natalensis* for which a suitable control has not, as yet, been found. The boom in Perrine lemons has run its course. The past winter resulted in grave damage to trees and future development appears unlikely.

874. HAAS, A. R. C. 581.144.2 : 632.181 : 634.653 + 634.3
Importance of root aeration in avocado and citrus trees.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 77-84.

In soil cultures at the Riverside Citrus Experiment Station avocado seedlings were submitted to various periods of water immersion lasting from 2 to 24 hours two or three times a week from January to September. Growth measurements did not indicate that the treatment had interfered in any way with growth. Rooted lemon cuttings were grown in water cultures kept at a pH of 4.5-5.0. Root and top growth were very much better in the aerated than in the unaerated cultures. The aerated culture flowered and produced half-grown lemons while the non-aerated culture did not flower. The non-aerated culture was later aerated and, although its root growth remained more or less unaltered, the top very soon sprang into growth, flowered and formed 13 fruits, one of which being cut open contained germinating seeds with long primary roots. Two-year-old Valencia orange trees were grown in 12 gallon containers of soil containing nitrogen in the form of calcium nitrate or ammonium sulphate and kept continually water-saturated. After 16 months the trees in the ammonium sulphate treated cultures were dead, but the others were alive and revived after drainage.

875. HODGSON, R. W. 634.653
Avocado research at the University of California, Los Angeles—Progress and plans.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 33-5.

A tendency has been established for large seed to produce large nursery trees and later large orchard trees. There is striking evidence available that local climatic differences have great effect on the Fuerte avocado. Topworking drone Fuerte trees with scions from healthy, high-yielding trees has proved successful. Efforts to turn the biennial habit of the Fuerte into an annual one have not been successful. The solution would appear to lie in the finding or creation of a variety with the fruit characteristics of Fuerte and the bearing behaviour of Lyon, Anaheim, Dickinson or Hass. New investigations concern breeding Fuerte and other varieties, embryology, morphology and anatomy and biochemistry of the avocado.

876. SCHROEDER, C. A. 634.653 : 581.46
Floral abnormality in the avocado.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 36-9, bibl. 2.

The following abnormalities were observed by the author in a study of some 9,000 flowers in 1939-40. Deviations from the normal number of stamens, pistils and perianth parts; fusion of parts and naked ovules; staminoidy, i.e. the conversion of other floral parts into stamens. Thus the normal flower has 9 stamens but flowers were found having from 4 to 14 stamens. Pistilloidy was of less frequent occurrence. The occurrence of naked ovules, i.e. pistils with ovules borne on the outside of the ovary either wholly or partially exposed—was noted in many cultivated varieties, in Fuerte and in Mexican seedlings. Considerable irregularity was found, but yield is thought not to be appreciably affected, since the irregularities do not necessarily impair the function of the flowers and also flowers are borne in enormous number.

877. COIT, J. E. 634.653 : 581.144.2
Avocado root development.
Yearb. Calif. Avocado Ass. 1940, 1940, pp. 46-9, reprinted from Pacific rur. Press, April 20, 1940.

The avocado is a surface-rooting tree and in its native habitat, the Central American tropics, its fibrous feeding roots just below the surface thrive under a heavy undisturbed mulch of leaves kept moist by frequent summer showers. How best to provide conditions approximating to this under the varied soil conditions of avocado orchards in California is here discussed.

878. ROUNDS, M. B. 634.653-1.543

Planting distances for avocados.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 45-6.

In a good soil it is suggested that Fuerte avocados should be planted at 48'×48' as permanent trees with other promising varieties interplanted. The fillers can be removed when thought expedient.

879. STROMBERG, E. O. 634.653-1.541

Care of avocado grafts.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 89-91.

The author in his practical notes gives information on the following subjects :—Protecting from sunburn by adequate covering with paper, burlap, etc. ; irrigation, which must be temporarily reduced to a grafted tree ; weed control ; suckering, suckers being removed every week or fortnight ; staking, this being essential in early stages ; pruning, which should aim at a symmetrical tree ; frost protection, protecting with burlap.

880. TRAUB, H. P., AND ROBINSON, T. R. 634.653-1.542

Effect of various degrees of heading back on subsequent growth of avocado trees.

Proc. Fla St. hort. Soc. for 1939, 1939, pp. 43-8.

Four degrees of cutting back 18-year-old and 15-year-old avocado trees were tried in south Florida in 1935 following damage by hurricane. A spreading variety like Linda was cut to approximately 3½ feet for the heavy treatment, and more upright varieties to about 5½ feet for the same class of treatment. It was found that the trees made a quick recovery when cut back severely. Even devitalized trees with good root systems, given proper feeding care at the time of cutting back, made satisfactory and promising growth. All types of treatment were actually followed by an improvement in fruiting wood. Of the four degrees the intermediate ones gave maximum responses in terms of total bearing surface during the experiment. It is thought that the most severe type may prove efficacious in cases of varieties showing an undesirable upright growth habit. The lightest degree of pruning is not successful with devitalized trees as it leaves the lower part of the tree unrejuvenated.

881. SMOYER, K. 634.653-2.411

Avocado tree decline.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 50-1.

The notable decline of avocado trees in California during the last few years is briefly discussed. It would appear that many of the trees are planted on shallow soils overlying soil structure highly impervious to water. Under the conditions of temporary waterlogging, which are thus liable to occur, the fungus *Phytophthora cinnamomi* is able to enter and grow in the roots and thus cause decline. It is suggested that particular attention should be paid to the question of irrigation and stagnant water round the roots. The trouble, which has been prevalent only in these last few years of abnormally large winter rainfall and has always tended to disappear in the summer, may possibly disappear if normal winter rainfall is again experienced, or may remain prevalent only in those soils which are unsuitable for avocado growing by reason of their shallowness or heavy substructure.

882. RUEHLE, G. D. 634.653-2.19 : 546.47

Zinc deficiency of the avocado.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 150-2.

It is found that little leaf (mottle leaf or frizzles) of avocado can be controlled by zinc sulphate combined with lime as a spray, the optimum times and amounts not having been determined yet. Observations strongly indicate that the use of synthetic forms of nitrogen to the exclusion of organic sources of this element is conducive to the development of these zinc deficiency symptoms.

883. LYNCH, S. J. 632.111 : 634.1/7 : 551.566.1

Observations on the January 1940 cold injury to tropical and sub-tropical plants.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 192-4.

General notes on susceptibility of different tropical fruits with particular note of racial susceptibility in avocado. Avocados ranged in descending order of hardiness as follows :—Mexican,

Mexican-Guatemalan hybrids, Guatemalan, Guatemalan-West Indian hybrids, West Indians. There was little difference in susceptibility as between different mango varieties. The extent of damage on many other tropical fruits is also noted.

884. WAGER, V. A. 632.411 : 634.653

The dying back of avocado trees in Southern California.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 40-3.

The presence of *Phytophthora cinnamomi* is liable to cause dieback of avocados in wet soils. When the fungus is absent trees can withstand submerging for as long as 9 continuous days without harm. But when it is present the wet condition allows the fungus to make an entry into the roots and kill them.

885. RUEHLE, G. D., AND LYNCH, S. J. 634.653-2.19

Copper sulfate as a corrective for dieback, a new disease of the avocado.

Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 152-4.

Avocado trees affected by dieback at first appear somewhat starved. Older leaves look dull, the veins first becoming prominent and then assuming a reddish brown colour which may gradually spread into the leaf blades. The premature shedding of such leaves may or may not be accompanied by a dying back of the tips. In more advanced stages the symptoms have certain characteristics in common with citrus dieback. The disease appears to be confined to trees growing in light sandy soils. Soil applications of copper, magnesium and manganese compounds indicate strongly that copper deficiency is responsible for the trouble and that it can be controlled by applications of copper sulphate to the soil.

886. RUEHLE, G. D. 634.653-2.48

Experiments for the control of fruit spots of the avocado.

Proc. Fla. St. hort. Soc. 1939, 1940, pp. 73-8.

Normal practice has been to control avocado spot caused by *Cercospora* and *Colletotrichum gloeosporioides* by spraying with 6-15-100 or 8-8-100 bordeaux 3 times a season. The trials described here indicate that cuprous oxide and tri-basic copper sulphate will give equally effective control. Their advantages over bordeaux are saving of time and labour in mixing, greater uniformity and stability of spray mixture and less residue deposited to cause scale increase.

887. ISSACOVITCH, C. 634.653

Romance of the avocado in Obera, Misiones, Argentina.

Yearb. Calif. Avocado Ass. 1940, 1940, pp. 62-7.

LEROUX, J. C. 634.653

The avocado in South Africa I and II.

Fmg S. Afr., 1940, 15 : 89-92, 147-9, bibl. 11, summarized Yearb. Calif.

Avocado Ass. 1940, 1940, p. 68.

WOLFE, H. S., AND LYNCH, S. J. 634.653-1.8

Fertilizer studies with avocados.

Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 147-50.

To be reported more fully elsewhere.

888. ATUMI, K. 634.452 : 581.49

Some studies on the stomata of kaki leaves. [Japanese.]

J. hort. Ass. Japan, 1940, 11 : 402-13, bibl. 5.

This is a report of an examination made by the author in 1939 into the number of stomata, stomatal index, size of stomata, growth of stomata, etc., in leaves of the Fuyu kaki. It was found that both the number of stomata and stomatal index were the largest along the central parts of the leaf, the next largest at the base, and by far the smallest at the apex and margins. Size varied but tended to be inversely proportional to density. The leaves attached to the lower, middle and upper parts of twigs were examined and those on the lower part showed the smallest number of stomata and stomatal index. When the leaves on the middle and upper parts were compared with one another, it was discovered as a general rule that those on the upper part contained more stomata and a higher stomatal index. There was no definite tendency as regards size in relation to these three positions. The formation of stomata showed marked lack

of uniformity. Some fully matured stomata were observed in leaflets which had just emerged and the stomata gradually increased in number. At the last stage of development some uniformity in growth was noted. Stomata in twigs developed at different times were studied. The growth of stomata was found to be comparatively slow at the beginning, but to accelerate gradually and full size was reached early in June. The investigation is still continuing. Our experience has taught us that in an examination of this kind it is best to select healthy leaves taken from near the top of a vigorous twig, the twig being split vertically in two, and the leaves being picked from the centre of one half. [From author's summary.]

889. TURRELL, F. M., SINCLAIR, W. B., AND BLISS, D. E. 634.62-2.4

Structural and chemical factors in relation to spoilage of dates.

Reprinted from *Rep. 17th annu. Date Growers' Inst. Calif.*, 1940, pp. 5-11, bibl. 13.

The paper deals with the calyx-end rot of dates caused by *Aspergillus niger* and side spot decay due to *Alternaria* sp.

890. STEVENS, H. E. 634.651-2.4+2.1+2.6

Papaya diseases.

Proc. Fla hort. Soc. for 1939, 1939, pp. 57-63, bibl. 6.

The incidence and control of the following papaw diseases are discussed:—leaf blight (*Pucciniopsis caricae*), powdery mildew (*Oidium* sp.), damping off (*Rhizoctonia* sp.), fruit rot (*Colletotrichum* sp.). Notes are also given on troubles due to low temperature, to moisture and drought and to nematodes.

891. LYNCH, S. J., AND FIFIELD, W. M. 634.651 : 581.192

Some chemical constituents of papayas and their relation to flavour.

Proc. Fla St. hort. Soc. for 1940, 1940, pp. 181-4, bibl. 3.

892. ANTEBI, S. 633.85

Oil crops—importance and cultivation.

Agric. Bull. Palestine, 1940, July-September, pp. 141-5.

Notes are given on the cultivation of the following oil crops with special reference to Palestine. Sesame, groundnut, sunflower, soya bean, certain varieties of which will succeed in Palestine, and castor oil.

893. STCHERBAKOFF, A. N. 634.63-1.53

On the vegetative propagation of olives. [Russian.]

Soviet Subtropics, 1940, No. 9, pp. 36-8.

The author discusses the respective merits of propagating olives from seed or cuttings. He experimented for several years with 1- and 2-year-old cuttings. In 1932, 8% of the cuttings became rooted, in the following year this percentage increased, and in 1937, as the result of more precise methods, 45% (and in one case 98%) became rooted. The use of a greenhouse heated to not less than 16° C. is essential. The cuttings must be taken, after the secondary growth has been made, from 2- and 3-year-old shoots, leaving in the second case a short length of the shoot with two buds behind, thus ensuring some material for cuttings in subsequent years. Not more than 50% of the top shoots should be used for cuttings, the others being used the following year. Cloudy and still weather should be chosen for taking the cuttings. The cut shoots should be spread out in the greenhouse in a layer 6 to 8 cm. deep and should be well watered at regular intervals to prevent drying up of leaves. The 1- and 2-year-old cuttings must be 8 to 9 cm. long with 3 to 4 buds, the leaves must be removed from the lower 2 buds and the shoot cut with a horizontal surface 2 mm. from the point where the first leaves are attached. The cuttings are then set in 8.5 cm. pots with sand, 6 per pot, the cuttings being set to a depth of two-thirds of their length, leaving 1 to 2 buds above the sand, and the pots well and regularly watered. The temperature in the greenhouse must be kept at 14° to 16° C. during day and 12° C. during night till the callus is formed and roots begin to grow in quantity, when it can be lowered to 12° C. by day. The greenhouse must be well ventilated and shaded on sunny days. In early April and again in the middle of May cuttings which have developed roots should be carefully transplanted, taking care not to injure the roots, into 9 cm. pots with

a mixture of garden and rotted compost soil in the proportion of 2 to 1, watered and left in the same greenhouse for some time. When the young plants again make roots they should be put out in the open in pots protected by glass frames and slowly accustomed to out-of-doors life. Watering must not be excessive and must be reduced and the drainage improved directly the upper leaves turn yellow. As soon as the plants get used to the sun, liquid manure can be given and the surface soil in the pots mulched with broken-up manure. During the first year glass frames must be available close to the pots, for putting over them as soon as the frosts set in, after the removal of all shoots longer than 3 to 5 cm., and their use as cuttings for propagation. In early May of the following year the olives can be planted out in the nursery at a distance of 0.7 by 0.5 m. from each other and given abundant organic fertilizer. The plants must be set in holes 30 by 30 cm. large, and from then on the only care needed is watering and hoeing. Two years later the plants are usually transplanted to their permanent position, being then bushy. The best time for transplanting under Baku conditions is either autumn preferably, or spring.

894. ANON. 634.63-1.542
Scientific ways of pruning olive trees.
Agric. Bull. Palestine, 1940, July, p. 134.

Old trees need rejuvenation every 12-15 years. This is done by removing decayed or ill-situated branches and heading back trees and branches that have grown too tall. The central erect branches should be removed to encourage a drooping habit and to admit light and air. Occasional pruning is carried out every 5-6 years to remove intergrowing or diseased branches. Annual or biennial pruning aims at achieving a balance between last year's growth of twigs and the expected flowering and fruit setting. The pruning is light in a good rainy season. If the season is dry a large part of the vegetative growth should be removed to promote fruit setting and the formation of bearing shoots for the next year. In Palestine early varieties are pruned from mid-November and late varieties from mid-January.

895. LE ROUX, J. C. 633.85
Tung oil.
Fmg S. Afr., 1941, 16: 123-5.

Data obtained from the results of the introduction of the tung oil tree, *Aleurites fordii*, into S. Africa are discussed. The soil and conditions in the Transvaal lowveld and Natal seem to suit the trees. Alkaline soils seem to be harmful. Many inferior types are to be found. Poor drainage, shallow infertile soil, top-soil erosion and high winds are all causes of die-back. The oil content and quality are good. Budding on stock of the same variety causes dwarfing. The trees are susceptible to hail and wind damage. Weevils, termites and grasshoppers have caused a reduction in yield. Over a twenty-year period a normally successful grove is estimated, at 70 trees per acre, to show an annual profit of £3 14s. per acre. Cultural practice is described. At present seedling trees of good parentage are recommended in preference to budding. The trees respond to manurial treatment. For trees of 8 years and over 5 lb. ammonium sulphate and 3 lb. superphosphate per tree per annum is suggested and smaller amounts for younger trees.

896. IVANOFF, S. M., AND IVANOVA, V. I. 633.85-2.111-2.19
On the causes of death of some trees of *Aleurites fordii*. [Russian.]
Soviet Subtropics, 1940, No. 10, pp. 26-32.

Following the severe winter of 1939-40, 5% of tung oil trees died off with a subsequent loss in yield of 20%. This phenomenon was observed particularly in the more developed, vigorous and high-yielding trees in the tung plantations of the Georgian S.S.R. [Caucasus]. It was found to be due to frost injury in trees already affected with bronzing or some similar deficiency disease. This disorder, considered by American workers to be a zinc deficiency disease, so lowers the frost resistance of tung that fully developed trees may perish from frosts some three years after infection has occurred. It is possible, however, that the dying-off of tung trees is also partly due to excess humidity of the soil during the winter-spring season, this being particularly harmful when combined with bronzing. In order to prevent the development of bronzing and dying-off the greatest care is essential in the plantation; this should include proper drainage, and zinc treatment wherever bronzing has become established.

897. WILLIMOTT, S. G. 633.85
Tung oil in Cyprus.
Bull. imp. Inst. Lond., 1940, 38 : 409-18, bibl. 12.

An account is given of the preliminary experiments on tung oil cultivation in Cyprus. Probably *Aleurites fordii* could be grown in certain areas in Cyprus provided some irrigation were supplied. In view of most of the irrigation water being required for citrus it would be better for the prospects of local tung oil production if it could be shown that the tree could be established in the rocky foothills where the rainfall is high enough to render irrigation unnecessary.

898. WEBSTER, C. C. 633.85-1.541.5
A simple method of budding tung trees.
Nyasaland agric. quart. J., 1941, 1 : 8-12.

The method of budding tung described and illustrated resembles the modified Forkert* with the difference that the flap of peeled down bark on the stock is used to cover the bud instead of being cut off just below it. The chip of wood at the back of the bud is removed before insertion. If a hole appears in the bark behind the bud after this operation the bud will be useless. The ideal seedling stock is about one year old, having a diameter of $\frac{3}{4}$ -1 $\frac{1}{4}$ inches at 3 inches above ground level. Low budding is advocated. The tie may be loosened in from 14 to 21 days.

899. TARAN, E. N. 633.85
On the differences in oils from monoecious and female trees of *Aleurites cordata*. [Russian.]
Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 19, pp. 13-6, 1940.

The results of several years' work near Sukhum indicate that monoecious and female trees of *Aleurites cordata* can be distinguished by chemical characteristics. The monoecious trees have a more energetic process of oil formation which begins and terminates earlier than that of female trees. The oil shows a higher iodine figure than that of female trees and a higher refraction. It sets and becomes jellied more rapidly after heating than that of female trees, its produce moreover showing a higher degree of density. In its reactions to heating and its constants the oil of monoecious *A. cordata* approximates to that of *A. fordii*.

900. PAINTER, J. H., AND SHARPE, R. H. 633.85-1.542
Preliminary experiments on pruning and training of one-year seedling tung trees.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 215-8, bibl. 1.

901. ROBINSON, B. B. 633.525.1
Ramie fiber production.
Circ. Dep. Agric. U.S. 585, 1940, pp. 14, bibl. 6.

The agricultural problems concerned with the successful growing of ramie, *Boehmeria nivea*, are discussed and obstacles which have impeded the production of this fibre in U.S.A. are pointed out. The cultivation of the crop is described. Sub-tropical districts having high rainfall are adapted for growing ramie though there must be cold resistant strains since the plant is grown in nearly every province of China. After harvest the cut tops must be quickly removed from the field both to allow the new growth to develop and to permit of rapid preparation of the fibre, failing which mould will develop with injury to the quality of the product. The manufacturing processes are briefly described but machinery is lacking for cheap extraction of a quality to compare with the hand manufactured Chinese product. The fibre is one of the strongest of plant fibres and has great durability, absorbency and lustre.

902. HAWKINS, R. S., AND AEPLI, D. C. 63
The Mesa experiment farm helps farmers to help themselves.
Bull. Ariz. agric. Exp. Stat. 171, 1941, pp. 159-86.

A picture is given of the work in agronomy, horticulture, animal husbandry and entomology carried out at the Mesa farm, Arizona. Some of the results obtained are mentioned.

* Described and illustrated in Vegetative propagation of tropical and sub-tropical plantation crops. Tech. Commun. No. 13, 1940. Imperial Bureau Horticulture, East Malling, 3s. 6d.

903. TROSKO, I. K. 634.574-1.541.5
The effectiveness of physico-chemical influences in propagating pistachio trees.
 [Russian.]
Soviet Subtropics, 1940, No. 8, pp. 32-4.

In grafting experiments conducted in Uzbekia during 1938 and 1939 the best results were obtained during the period 11th to 15th August using patch buds of current year shoots. Better results were achieved with patches 2 to 2.5 cm. wide reaching about three-quarters of the way round the stem than with similar ones going only a quarter or half way round or with patches completely encircling the stem. Propagation results were not affected by the sex of the stock; the operation was most successful in the early morning from 5 to 8 a.m., the next best time being from 6 to 8 p.m. During the hottest months of the year propagation on the north side of the stock was less satisfactory than on the south side. The use of current year shoots as stock instead of those of the previous year resulted in 60% of the buds shooting in the same year as against 13%. Fitting scion buds into the exact places from where buds were removed on the stocks gave 72% successful graftings and 55% of buds shooting in the same year as against 37 and 6% when buds were merely inserted in the smooth parts of the stem. Success was much increased by wiping the knives and other tools dry with the help of a cloth soaked in a wax-dissolving solution before each operation. Preliminary experiments showed that failures were mainly due to the action of turpentine, which liquifies under the heat of the sun, penetrates under the protective patch and injures the tender cambial tissues of both scion and stock. Of the various methods applied to counteract this harmful effect the best results were obtained by impregnating the patch with paraffin or by fixing a moist cotton covering over a wet binding over the patch (95% success) or covering it with binding tape soaked in boracic acid or potassium permanganate.

904. SHOUTOFF, P. A. 633.86.11.871-1.534
Propagation of eucalyptus by layering. [Russian.]
Soviet Subtropics, 1940, No. 8, pp. 30-1.

Propagation of eucalyptus trees (*Eucalyptus rostrata*) was successfully achieved in 1938 at the Azerbaijan Station by layering 1- or 2-year-old side shoots growing at the base of the trees, the shoots being bent sideways and laid along the bottom of trenches (12 to 15 cm. deep) dug radially from the tree, and then covered up with earth to a length of from 20 to 70 cm. When examined in 1939, 12 out of 24 shoots thus layered had rooted. The failure of the remainder to develop roots was thought to be due to the weakness of the shoots, their underground parts measuring 20 to 30 cm. only with a diameter of 0.35 to 0.25 cm. in their lower and 0.3 to 0.2 cm. in their higher part. Stronger shoots measuring not less than 50 to 80 cm. with a diameter of not less than 0.4 to 0.6 cm. took root better, and when carefully chosen in this respect, all shoots were found to develop roots satisfactorily. Dug up and transferred indoors 10 months after layering, two shoots exhibited a well-branched root system, callusing taking place two weeks after the layering and the complete development of the root system being achieved at the end of five to eight months.

905. WIMBUSH, S. H. 634.973.737
Methods of planting wattle.
E. Afr. agric. J., 1941, 6: 205.

Three methods of planting wattle were compared in trials including seven replications at Kikuyu in Kenya in a moderate rainfall area. 1. Specially treated seed was sown. The treatment consisted of placing the seed in a pot of boiling water which is immediately removed from the fire and allowed to stand 12 hours. The seed is then spread out to dry. 2. Natural seedlings were transplanted with bare roots. 3. Nursery raised transplants 3 inches high from trays, soil adhering to the roots. After 6 months 87% of the treated seed plants were surviving, only 14% of the bare root plants and 71% of the nursery transplants. Three years later the heights of all 3 treatments were about the same and no further trees had died. The extra cost of the nursery raised transplants is not worth while except in areas of heavy rain where weed growth is very vigorous. A successful if tedious way of establishing small plantations is to dig up little groups of 3-6 natural 1-inch to 2-inch seedlings and to transplant with soil intact.

906. LEDEBOER, M. S. J. 634.973.737 : 632.3/4
Developments in pathological research on wattles.
Reprinted from *J. S. Afr. For. Ass.*, 1940, No. 4, pp. 28-45, bibl. 23.
Notes on the incidence and phenomena of gummosis, Albert Falls disease and root collar rot on wattles in Natal and the Eastern Transvaal.

TROPICAL CROPS.*

907. CLARK, W. M. 632.51 : 631.875
The gold in the dirt.
Indian Fmg., 1941, 2 : 127-9.

An account of the method adopted in Bengal for persuading cultivators to turn the water hyacinth, which infests the streams and waterways, into a composted manure. All that is demanded is that the cultivators collect the weed and heap them up. For those who display some interest Government demonstrators will show how rotting can be accelerated by flinging on to the heaps a slurry of fresh cowdung and manure to create a sharp rise in temperature. Water hyacinth weeks are also held in which the mass collection of the weed is carried out. Analysis of random samples of water hyacinth compost show a percentage of nitrogen on a dry basis of 1.12%.

908. CLEMENTS, H. F. 589.518 : 581.13
Movement of organic solutes in the sausage tree, *Kigelia africana*.
Plant Physiol., 1940, 15 : 689-700, bibl. 10.

An attempt was made to explain the movement of organic solutes, presumed to be sugar, into the fruit of *Kigelia africana* on the assumption of the mass flow hypothesis. The hypothesis was found to be inadequate for reasons which are explained. The author concludes that the observed movement of sugar into the fruit is so great that it seems necessary to describe it as a function of the living protoplasm of the sieve tube, which, through its respiratory activity, does the work in the movement.

909. HUTCHINGS, C. D. 631.874
The edua pea.
J. Jamaica agric. Soc., 1940, 44 : 510.

Mucuna edulis is a first class leguminous green manure and cover crop extremely tolerant of soil types and in Jamaica unaffected by elevation or changing seasons. The peas can be consumed as a fresh vegetable or in soups, etc., when half grown, but in later stages are indigestible. Fodder cut from the crop is very palatable to cattle. Only 6-8 weeks are required for maximum vegetative growth and 120-180 days for the production of dry seed. An acre reseeded after cutting should produce 25 tons of fodder per annum. Planting distances suggested are for green manure 1 ft. x 2 ft. and for seed production 30 in. x 30 in., in each case two seeds to a hole. The only diseases observed so far are fungal rots caused by contact of heavily shaded pods with the damp ground.

910. MIDDELBURG, H. A. 631.874
Enkele beschouwingen en mededeelingen over selectie bij *Crotalaria juncea*.
(Selection of *C. juncea*.)
Bergcultures, 1941, 15 : 208-11, bibl. 4.

The Proefstation voor Vorstenlandsche Tabak, Java, as a result of selection over a period of 10 years has produced a strain of *Crotalaria juncea* which, as a green manure, yields about 18% more material than unselected strains. Because of cross-pollination it is difficult to keep the strain pure and planters in possession of the improved strain are recommended to save and select their seed from an isolated batch which they should grow specially for the purpose.

911. JAMAICA, DEPARTMENT OF SCIENCE AND AGRICULTURE. 63
Reprints of miscellaneous articles 1938.
Bull. Dep. Sci. Agric., Jamaica, 25, 1940, pp. 90.

Nineteen articles are reprinted from the journal of the Jamaica Agricultural Society 1938. Ten deal with livestock. Of the remainder those of interest to this Bureau have already been abstracted.

* See also 851.

912. LABORDE, R. 633.4
 Notas sobre el cultivo y utilización de la chufa. (**Cultivation and use of *Cyperus esculentus*.**) [English summary.]
 Reprinted from *Rev. As. Ing. agron. Uruguay*, 1941, No. 1, pp. 3.
 Edible *Cyperus esculentus*, Spanish variety, grown in Uruguay, yielded without irrigation 2,300 kg. per hectare and with 3 irrigations of 22 mm. each, 2,950 kg. Chemical composition of irrigated and non-irrigated plants are compared and the characteristics of the fat discussed. Its main use is as a food for cattle, pigs and poultry.
913. BURMA, DEPARTMENT OF AGRICULTURE. 633.491 : 658.8
Potato.
Markets Section Survey, Dep. Agric. Burma, 11, 1941, pp. 79, 2s. 3d.
 A survey is made of the potato industry in Burma with special reference to marketing. The annual Burma demand is more or less stabilized at 20,000 tons, the only export being to Calcutta. Three crops a year are taken.
914. JAYNES, H. A., AND BYNUM, E. K. 632.78 : 632.961
Experiments with *Trichogramma minutum* Riley as a control of the sugarcane borer in Louisiana.
Tech. Bull. Dep. Agric. U.S. 743, 1941, pp. 42, bibl. 16.
 Mass releases of *Trichogramma minutum* in the cane fields of Louisiana during three seasons had no effect in controlling sugarcane borer, *Diatraea saccharalis*.
915. DRUMMOND, O. A., AND HIPÓLITO, O. 633.682-2.3
 Notas sobre a bacteriose da mandioca. (**Milk disease of cassava.**) [English summary.]
Ceres, 1941, 2 : 280-307, bibl. 23.
 A bacterial disease known as milk disease (leitera) of cassava (*Manihot* vars.) is described, of which the causal organism is *Bacterium manihoti* n.sp. The disease is spread by contaminated dew and rain drops and by the planting of infected cuttings. Control can only be obtained by the use of uninfected planting material and by the raising of resistant varieties. Of 70 varieties of cassava studied, 5 showed some resistance. The disease is somewhat serious in parts of Brazil.
916. PARK, M., AND FERNANDO, M. 633.71-2.48
Recent research in Ceylon on the frog-eye disease of cigarette tobacco.
Trop. Agriculturist, 1940, 95 : 131-5, bibl. 6.
 Frog eye of tobacco (*Cercospora nicotianae*) is unimportant in most countries but in Ceylon causes damage to cigarette tobacco in the field. The investigations on this disease since 1937, mainly carried out by the authors, are summarized and certain recommendations for control are made.
917. SAMARINA, A. P., AND KOLELISHVILI, M. V. 633.72-1.521
The anatomical method in tea selection. [Russian.]
Soviet Subtropics, 1940, No. 9, pp. 30-3.
 In order to find drought-resistant tea bushes for planting in areas with dry summers, 1-year-old leaves from Chinese tea bushes growing in various ecologically different districts of the Caucasus were examined for the thickness (in mm.) of leaf, cuticle, and epidermis, the length of the palisade parenchyma and thickness of its cells, number and size of stomata and the cell size of lower and upper epidermis. These characters were found to vary very much with the locality. Long elongated palisade parenchyma and few stomata are indicative of susceptibility to drought. The relation of the palisade to the mesophyll parenchyma was 44 to 56 in a moist district and 49 to 51 in an arid one. Within the various localities the thickness of the leaf was related to the age of the leaf and of the bush. With the beginning of the dry period in summer, tea leaves begin to coarsen, the blade folds up, and the leaves turn vertically to the stem, this last characteristic becoming more and more pronounced as the drought increases. The number of layers of the palisade parenchyma varies with the variety of tea, the drought-resistant ones, e.g. the

Japanese teas, usually having the greatest, namely, three. The size of cells in the palisade parenchyma in drought-resistant varieties is smaller than in the others. The results of the examination showed that in samples of Chinese tea the relation of the palisade to the mesophyll parenchyma was 1 to 1 or 1.2 to 1, while in the more drought-resistant Japanese tea the relation was 0.144 to 0.138. Among the most drought-resistant was the medium-size-leaved Chinese tea bush No. 10, characterized by light green foliage, very blistered leaf surface, and abundant vegetation, which showed an average leaf thickness of 0.408 mm., a length of palisade parenchyma of 0.162 mm., a thickness of mesophyll parenchyma of 0.204 mm., and 30 stomata in the field of vision under the microscope, the corresponding figures for a medium-resistant bush from the same plot being 0.330 mm., 0.120 mm., 0.168 mm., and 24 stomata respectively. Another Chinese tea bush, No. 20, characterized by large, dark green leaves with a peculiarly dentate blade, a rather blistered surface, very coarse old leaves, and a large number of shoots, showed the following corresponding figures: 0.420 mm., 0.168 mm., 0.210 mm., and 36 stomata respectively. The bushes with medium-size leaves proved, however, to give larger yields than those with large ones. These studies show that the degree of drought-resistance of the tea bush can be determined by anatomical examination.

918. VAN EMDEN, J. H. 633.72-1.541.11
Opzet en inrichting van de proeven tot locale toetsing van een aantal geselecteerde thee-cloonen. (**Layout of local tea clone trials.**) [English summary 1 p.]
Arch. Theecult. Ned. Ind., 1940, 14 : 91-115, bibl. 3.

The paper deals with the testing of tea clones in 18 localities in the tea districts of Java and Sumatra on ground not previously under tea. There are 5 replications and 80 plants to a plot, planting distance 3×5 ft. The majority of plants will have been budded and grafted on site, though a few stumped buddings will be used. Yield will be judged by periodically weighing 10 consecutive pickings. Other criteria are width of bush, density of shoots, growth of shoots, occurrence of flowering, susceptibility to drought, mosquito blight, branch canker, mites, pink disease (*Corticium salmonicolor*).

919. ZALDASTANISHVILLI, SH. G. 633.72-1.535
Further notes on the vegetative propagation of tea. [Russian.]
Soviet Subtropics, 1940, No. 10, pp. 10-4.

The author states that the quality of tea in the Caucasus plantations suffers from the presence of inferior bushes, mainly owing to the uneven nature of the seed material used. It is, therefore, considered necessary to develop methods of vegetative propagation. In experiments carried out at Batoum in winter 1937/38, December proved to be the best time for propagation by cuttings. The cuttings were taken from a 12-year-old plantation, woody, brown shoots from the last vegetative period with 3 to 4 leaves being selected. After treatment with heteroauxin (concentrations of 1 in 25,000; 1 in 10,000; 1 in 5,000; and 1 in 2,500 for from 16 to 72 hours) the cuttings were set in washed sand in a greenhouse with a constant temperature of 20° to 25° C. and sufficient air humidity. The results show that treatment with heteroauxin at first stimulated root development but after 7 months it was found that the untreated controls gave 80 to 85% of rooted cuttings as against 45 to 70% of those treated with heteroauxin. This is explained by two facts: that some concentrations of heteroauxin are toxic to cuttings and that the cuttings are capable of becoming rooted without any special treatment. The roots developed, however, more abundantly in treated cuttings. The toxicity of the heteroauxin increased with higher concentrations. Cuttings which became rooted were first potted and later planted out when they developed normally, forming a good root system with a particularly strong main root.

920. PFÄLTZER, A. 633.72-1.536
Verdere gegevens van de plantwijdteproef op Pasir Junghuhn. (**Further data on a tea spacing experiment.**) [English summary 1 p.]
Arch. Theecult. Ned. Ind., 1940, 14 : 118-28.

Over a period of about 10 years the closest plantings of tea have given the highest cumulative yields. The largest total yield was produced by the hedge system plots, 6,695 bushes per acre. The yield per bush increases with the planting distance.

921. BOND, T. E. T. 633.72-2.19-1.83
Potash deficiency in tea cultivation.
Tea Quart., 1940, 13 : 139-45, bibl. 1.
 EDEN, T. 633.72-2.19-1.83
Note on potash deficiency in tea cultivation in relation to Ceylon conditions.
Tea Quart., 1940, 13 : 146-7.

In the first paper Dr. Bond of the Tea Research Institute, Ceylon, reviews de Haan and Schoorel's paper "Kaligebrek in de theecultuur" (Potassium deficiency in tea cultivation).^{*} In the second paper Dr. Eden gives some results obtained from experiments still in progress. These bear out the Dutch results so far as the conditions are comparable, namely, stated generally, that the potash content of the tea leaf is susceptible to modification within wide limits by the amount of potash available in the soil. A beneficial effect from adding potash fertilizers may be expected on soils containing up to 0.17% of potash. On soils increasingly rich in available potash this effect is rapidly diminished. The plant, however, can, it is suggested, accumulate potash in amounts appreciably in excess of its maximum requirements for growth and crop production. In Java potash deficiency reduces the prunings by more than 50%, but in Ceylon the difference is only 2.5%. In Ceylon 9 years' cessation of manuring with potash has diminished yield neither of flush nor of wood nor, over a 6-year period, has it reduced the foliar diagnosis figure to the deficiency level.

922. GOLETIANY, G. I. 633.72-1.84/5
The effect of environment on the nitrogenous and phosphatic nutrition of the tea plant. [Russian.]
Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 17, pp. 25-7.

The application of nitrogen, in the form of ammonium sulphate, to subtropical soils (Caucasus) resulted in a considerable increase of soil acidity (the pH of the water suspension dropping in most cases to 4.0) and better yields of tea plants, on which the acidification of the soil did not seem to have any harmful effect. The application of ammonium sulphate considerably increased the amount of soluble phosphates in the soil. It was found to be the best form of nitrogenous fertilizer, ensuring an uninterrupted increase in the yielding capacity of the tea plant.

923. BRUCE, A. 631.84 : 633.72 + 633.912
Periodicity of nitrification. I. Tea area. II. Rubber area.
Trop. Agriculturist, 1940, 95 : 325-32, 1941, 96 : 28-34.

The periodicity of nitrification of the soil on 2 tea and 2 rubber estates in Ceylon is examined and from the data obtained the optimum times of manuring are deduced. In all cases the need for manuring twice yearly rather than the usual once is stressed.

924. BURMA, DEPARTMENT OF AGRICULTURE. 633.73 : 658.8
Coffee.
Markets Section Survey, Dep. Agric. Burma, 12, 1940, pp. 51, ls. 1d.

A survey of the coffee industry of Burma with special reference to marketing. The industry is mainly a peasant industry and the methods employed in all branches of the industry appear to be primitive.

925. VAN DER VEEN, R. 633.73
Koffieproducties. (Coffee production.)
Bergcultures, 1941, 15 : 278-85, bibl. 10.

The numerous factors, favourable and adverse, which can influence yield of coffee plantations are discussed in a general way. These are root competition, overbearing, pruning, shade, disease, weather, grafting, selection in the nursery or by thinning, soil maintenance and others.

926. SRINIVASAN, K. H., AND NARASIMHASWAMY, R. L. 633.73-1.523
A review of coffee breeding work done at the Balehonnur Coffee Experiment Station.
Planters' Chron., 1941, 36 : 96-8, being extracts from *Bull. Mysore agric. Dep.* 20.

An account is given of breeding technique for the use of planters who may wish to take up this work. Various mother plants are described and a number of particulars concerning these stock

^{*} *Arch. Theecult. Ned. Ind.*, 1940, 14 : 43-81 and *Bergcultures*, 1940, 14 : 1292, 1336-9. *H.A.*, 11 : 195.

plants are tabulated. Photographic illustrations of these bushes are also given. Attack by the fungus *Hemileia vastatrix* is the major factor in depressing yield. The production of resistant varieties is therefore of prime importance in the breeding programme. Difficulties are increased by the fact that there are four strains of the disease which appear to be inherited in different ways. Some progress has been made in that a type or types resistant to two of the commoner *Hemileia* strains have been selected.

927. SNOEP, W., AND VAN DER VEEN, R. 633.73
 Enkele gegevens en een beschouwing over plantverband bij koffie. (Spacing
 in coffee plantations.)
Bergcultures, 1941, 15 : 180-5, bibl. 3.

The following questions are asked :—1. In coffee planting is the optimum yield obtained by an initial close planting to be followed by a gradual thinning out ? 2. What advantage is to be gained by grouping the trees in close planted rows or hedges ? 3. Is it the case that in many old plantations the optimum yield can never be attained on account of overcrowding ? 1. Close planting gives more opportunity of selective thinning but the ground will have to be well manured and artificially enriched since cover crops will not grow under close planted coffee. With wider spacing a cover crop can be grown for two years or so until the plantation fills out. In close planting the new strong-growing *Leucaena* should be used because of the value to the soil of its greater leaf fall. Especially on poor ground the advantages of the close planting and selective thinning method are more theoretical than practical. 2. Close planting in spaced rows (hedges) admits of the maintenance of a cover crop, allowing manure to be brought to the trees, and when thinning is carried out the eventual spacing is more even. The experiments in progress are too recent for definite results to be available. 3. Undoubtedly many old close-set plantations do not yield their optimum but thinning may not be the solution. For instance part of a seven-year-old plantation spaced 7'×7' had every third row removed. In the five years which followed, the yield from the unthinned portion was never less than 10% higher than that of the thinned so that no advantage was gained by thinning. However, careful selective thinning of 25-30% of the lowest yielders, which as a rule bear only 10% of the crop, can improve yield. The oldest plantations have probably been thinned naturally by dieback of branches and the dying off of trees. They have been supplied by young plants and old and young are mixed together. The uneven canopy thus produced is favourable for assimilation by the foliage and consequently for fruitfulness. Thinning here is certainly unnecessary.

928. LUCY, A. B. 633.73-1.8
Coffee manurial and mulching experiments.
Malay. agric. J., 1941, 29 : 68-77, bibl. 4.

An account is given of a coffee manurial experiment laid down in 1933 at the Experiment Station, Serdang, and of a mulching experiment superimposed on part of this in 1938. *A. Coffea liberica*. Rock phosphate at 4 cwt. per acre per annum gave a mean increase of 26%. This rose to 55% when 2 tons of green manure per acre per annum were added to the above. Small amounts of N and K in conjunction with phosphate gave no further increases. The mulch consisted of grass and leaves applied at the rate of 10 tons per acre every 6 months. The layer was 3-4 inches deep and covered all the ground. The bushes improved in appearance after 4 months. No increase in yield occurred till the second 12 months, when 127% was obtained. Mulch alone has given an increase of yield 55% better than that of the best manurial plots. It is noted that a mulch using only half the quantity of material produced an increased yield of 101%, the full mulch therefore giving only an additional 26%. *B. Coffea robusta*. This species does not grow well at Serdang. It has not responded to manures but mulching increased yield in the second year by 59%.

929. CHEESMAN, E. E. 633.74
The case for long range research in cacao production.
Trop. Agriculture, Trin., 1940, 17 : 203-7.

The long range research work in cacao production undertaken at the Imperial College of Tropical Agriculture, Trinidad, is reviewed. The case is put for its continuance and the substantial results so far achieved are briefly discussed. These are :—Selected material of a very high

standard of yielding power and of various grades of quality has been made available to the planter. A practical process of vegetative propagation is ready for application. Figures of actual yield of selected material under plantation conditions are becoming available. More precise knowledge is available on self-incompatibility in cacao, on what constitutes a good environment for a tree and on the identification of nutrient deficiencies leading to means for their cure. Greater precision in field experiments has been obtained, methods of estimation in biochemical studies have been improved and horticultural experiments have been planned to yield information continuously for many years to come.

930. E.E.C[HEESMAN]. 633.74 : 575.24

Note on a mutation in cacao.

Trop. Agriculture, Trin., 1940, 17 : 139.

An abstract is given of an article* from the Cacao Institute at Bahia describing a case of mutation in the Brazilian variety of cacao referred to as *Theobroma leiocarpa* Bern var. *Comum*. The abstractor's comments add to the value of the information provided.

931. POSNETTE, A. F. 633.74-2.8

Swollen-shoot virus disease of cacao.

Trop. Agriculture, Trin., 1941, 18 : 87-90, bibl. 9.

Swollen-shoot of cacao, a recently discovered and rapidly spreading virus disease in West Africa, is regarded as being one of the most serious cacao diseases known. In this article the early diagnosis of the disease, negative results for inoculation, successful transmission by budding and by seed and positive results for transmission by the cacao psyllid, *Mesohomotoma tessmanii*, are recorded. Transmission by pollen is a possibility now being examined. Symptoms are chlorosis of the young leaf followed by leaf shedding with subsequent reduced flushes and inability to recover from the attacks of the capsids *Sahlbergella* spp. Die-back follows rapidly and in about a year the trunk dies back to ground level, any recovery being only temporary. The swellings on the shoot depend for development on a vigorous flush of growth and may not appear at all if defoliation and dieback is rapid. A mild type of disease is recognized and has been transmitted separately, showing little chlorosis, many very pronounced swellings and slow deterioration. All that can be done in the way of control is to re-establish forest conditions with a view to the replanting of cacao in the future.

932. NICOL, J. M. 633.74-2.7

Insect infestation of cacao beans in the producing countries.

Bull. imp. Inst. Lond., 1941, 39 : 17-25, bibl. 4.

As a result of a survey carried out between 1936 and 1939 it was established that infestation of cacao beans usually begins before the cacao has even reached the port of shipment. The lepidopterous species chiefly causing damage are *Ephestia cautella* from West Africa and *E. elutella* (cacao moth) from S. America. In common practice both moths are referred to as *E. elutella*, in fact misidentification is so frequent that references to *E. elutella* in literature have little value since they may refer to either species. *E. cautella* is usually correctly identified. Other moths and beetles identified did little damage. The need of cleanliness and anti-moth precautions in all cacao stores is stressed. Damaged and germinated beans are most subject to attack and should be reduced to a minimum. *E. cautella* and *E. elutella* can both survive and propagate under storage conditions in Great Britain.

933. BETREM, J. G. 633.74-2.754 : 632.951.1

Verdere gegevens omtrent de bestrijding van de *Helopeltis* door middel van derrispoeder. (Further data on the control of *Helopeltis* with derris powder.)

Bergcultures, 1941, 15 : 238-49, bibl. 2.

Derris dust (0.75% rotenone content) applied every 14 days to cacao will control *Helopeltis*. Little and often is much more effective than the use of large quantities at longer intervals. Spraying should start when more than 80 adult *Helopeltis* are found per 100 full bearing trees. The dust was and may be applied with the Niagara Dust Gun. Instructions are given for dealing with some of its idiosyncrasies.

* Miranda, S., and Silva, P. Mutacoes em *Theobroma leiocarpa* Bern. var. *Comum*. *A Bahia rural*, Oct.-Nov. 1939.

934. CAMPBELL, A. H. 633.832-2.19
"Sudden death" of clove trees.
A.R. Dep. Agric. Zanzibar for 1940, 1941, pp. 1-2 and Crown Colonist, 1941, 11 : 381.

The Annual Report contains a brief note on part I of Dr. Campbell's report on the sudden dying off of clove trees in Zanzibar which he has recently investigated. He concludes that death cannot be attributed to a pathogenic organism but is a functional disorder brought about by drought and inundation, exceptionally heavy cropping, mutilation of roots by irregular cultivation and of branches by picking heavy crops and the effect of opening the canopy on the water balance of the tree and on soil conditions. As far as mature plantations are concerned no economically possible method of preventing "sudden death" can be devised and the problem resolves itself into one of regeneration.

935. CULTUURTECHNISCH INSTITUUT. 633.833
 Culturaanwijzingen voor kaneel. (**Cultivation methods with *Cinnamomum zeylanicum* Breyn.**)
Landbouw, 1941, 17 : 63-4.

In Buitenzorg the cinnamon seed ripens in December-January and must be sown at once to prevent loss of viability. The seeds are sown in covered seed beds, being set about 1 cm. apart, and germinate in 20-30 days. A fortnight later they are transplanted to artificially shaded nursery beds and spaced 20×20 cm. Eight to ten months later they are ready for planting in the field, where spacing is 2×2 m. *Cinnamomum zeylanicum* does best below 1,500 ft. and can be planted between fruit trees or young rubber. If grown separately a tall cover crop such as *Crotalaria anagyroides* is recommended to provide a temporary shade. A layer of mulch over the soil has also proved very beneficial. In 2-3 years the first crop is taken by cutting the stem nearly to the ground. Two to four shoots are subsequently allowed to grow up from the stump. The best time to take the bark is when the shoots are 1-1.20 m. long and 1-2 cm. thick and the bark is ashy grey in colour. Older or younger bark gives a less aromatic product. Before cutting a shoot it is usual to test it to see if the bark peels easily, and for the same reason the harvest is generally taken in the rainy season.

936. GREENWAY, P. J. 633.88
Empire production of drugs. 1. Stramonium.
E. Afr. agric. J., 1941, 6 : 199-200.

Stramonium is obtained from the dried leaves and flowering tops, collected in flower, of *Datura stramonium* and *D. tatula*. Probably a native of the Caspian Sea region it is now widely naturalized in East and South Africa. In cultivation the seed should be thinly drilled in rows 2 ft. 6 in. apart or broadcast very thinly and lightly harrowed. A deep rich soil is preferred. Weeds should be kept down and the seedlings thinned to at least 8-12 inches apart. Curing consists only of careful air drying in a shady place or in an artificially heated drying room at 100° F. Drying should be just sufficient to prevent the leaves becoming mouldy in transit. The properly prepared leaves will be dark-greyish green and much shrivelled. A yield of 700 lb. of dried leaves to the acre has been obtained in Kenya. The British Pharmaceutical Standard permits not more than 2% of foreign matter, not more than 20% of stem, not more than 1% of stem having a greater width than 4 mm., and not less than 0.25 of the alkaloids of stramonium calculated as hyoscyamine. Ash must not be more than 20% and acid-insoluble ash not more than 4%. The seeds are also acceptable to the British Pharmacopoeia. In December 1940 the open-market quotation in London was for Continental 130s. per cwt., Indian 80s. per cwt.

937. SEN, S. C. 633.88.51
Cinchona cultivation in India.
Curr. Sci., 1941, 10 : 223-7.

The author is concerned with the economic possibility of establishing a satisfactory cinchona industry in India. He quotes considerably from Wilson [*Misc. Bull. imp. Coun. agric. Res India* 29, 1940; *H.A.*, 11 : 573]. He considers that India's need for adequate supplies of quinine is urgent, that the time is favourable for the development of an indigenous industry but that the first essential is the formulation of a co-ordinated scheme of work and the pooling of all resources in its execution.

938. FORD, C. E. 633.912-1.541.11
Identification of Ceylon clones of *Hevea braziliensis*.
 Rubber Research Scheme, Ceylon, pp. 32, undated.

The best time for identification of *Hevea* clones is when the budded plants are 6-18 months old, at which age the clonal characters are easy to observe and show their greatest constancy. A description and usually more than one illustration accompanies each of the clones dealt with.

939. RUBBER RESEARCH INSTITUTE, MALAYA. 633.912-1.874
The uses and control of natural undergrowth on rubber estates.
Planting Manual Rubb. Res. Inst. of Malaya 6, 2nd edit., 1940, pp. 37 + 17
 and 85 pp. figs., \$2.50.

When the first edition of this manual was published in 1934* the merit of ground cover for rubber as against clean weeding was still a matter for argument. To-day clean weeding is a memory of the past and discussion now centres on the comparative merits of a natural undergrowth of indigenous plants or of introduced leguminous covers. The discussion of the question is to form the subject of a separate publication. The object of the present manual is to consider the best methods for the establishment, maintenance and control of indigenous cover plants. The first edition, which was by W. B. Haines, has been considerably revised and enlarged while the figures of plants, beautifully drawn by Mr. Ho Choo Chuan, have increased from 17 to 69. The botanical, English, Malay and Tamil names are listed. In order that the manual and the appendix containing the figures can be used simultaneously they have been ingeniously bound so that while closed they form one book; when open they lie side by side like Siamese twins and similarly it would require a major operation to separate them.

940. D'ANGREMOND, A., AND VAN HELL, W. F. 633.912 : 581.144.2 : 581.8
 Mycorrhiza van *Hevea brasiliensis* Muell. Arg. (*Hevea mycorrhiza*.) [English summary.]
 Reprinted from *Verslag 27th Vergadering van de Vereeniging Proefst.-Personeel, Medan*, April 1939, pp. 16, bibl. 25.

The more important literature on mycorrhiza is briefly reviewed and a description given of the mycorrhiza occurring in *Hevea*. This is a typical endotroph occurring only in the cortical tissues and chiefly in the finer rootlets which are shorter and thicker and yellowish brown in colour. Penetration occurs in the youngest root tips, in the rootcap, root hairs and through the old epidermal cells. The hyphae are both intra- and inter-cellular and show the typical properties of a mycorrhizal fungus. The fungus is tentatively assumed to be *Rhizoctonia bataticola* (Taub.) Butler which is widespread in the tropics.

941. WA. 633.912-1.556.8
 Tappen met een spiraalsnede over den geheelen omtrek. (**Tapping on a full spiral or S/1.**)
Bergcultures, 1941, 15 : 212-3, bibl. 1.

942. MONTGOMERY, R. H. 551.566.1 : 634/5
The Fairchild tropical garden.
Proc. Fla. hort. St. Soc. for 1939, 1939, pp. 48-50.

A brief, witty report of the progress of the Fairchild Garden, 83 acres for which were acquired near Miami, Florida, in March 1938. The aim is the introduction and distribution of new tropical trees, plants, shrubs and flowers. It is noted that such plants can also be obtained from the U.S. Plant Introduction Garden at Chapman Field and from the State Station at Homestead, Fla.

943. FAIRCHILD, D. 634.1/8 : 551.566.1
Some tropical fruit possibilities for Florida.
Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 9-16.

The author describes fruit trees which might well be tried in Florida. They include members of the following families in particular :—Annonas, Lucumas, Eugénias, Garcinias, Avocado relatives, Mango relatives, Citrus relatives, as well as White Sapote, Litchee and Longan, and a number of miscellaneous fruits.

* H.A., 1935, 5 : 130.

944. FAIRCHILD, D. 634.6 : 551.566.1

***Malacantha*, a wild fruit tree of the Gold Coast.**

Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 40-2, bibl. 1.

An account of the raising in Florida of *Malacantha alnifolia* from seed taken at Aburi, Gold Coast. The difficulty lies in getting it to seed under Florida conditions since so far it has produced there no pollen-bearing stamens.

945. MUSTAFA, A. M. 634.25 : 551.566.1

Peach growing in Baluchistan.

Indian Fmg., 1941, 2 : 124-6.

An account is given of the method or lack of method observed in growing commercial peaches in Baluchistan. The use of proved methods as used in America and other successful peach growing countries is urged. The best American canning varieties have been imported and are doing extremely well. They are on peach stock, whereas the local growers use bitter almond 80% or apricot 20%. Since the Fruit Experiment Station at Quetta can supply the modern commercial peach varieties in quantity at reasonable rates, the planting of unsuitable local varieties should be discontinued. Other parts of the civilized world with much heavier overhead charges can make peach growing pay and there is no reason why Northern India should not do the same. A list of available peaches of commercial importance, both Indian and Californian, is given.

946. GONZALEZ, L. G., AND GLORIA, P. E. 634.433-1.541.5

A study on budding the star apple with special reference to the modified Forkert method.

Philipp. Agric., 1941, 29 : 861-76, bibl. 8.

An attempt was made to bud 20 1½-year and 587 3-year-old seedling stocks of the star apple, *Chrysophyllum cainito*, at the Philippine College of Agriculture. Of the methods used, modified Forkert, patch, shield and H budding, only the first gave any success worth mentioning and this was so small as to render the method commercially impracticable. A number of treatments to which the stocks and scion wood were subjected were of little use but there is some slight evidence that transplanting the budded stocks (balled) to cans and at the same time heavily pruning the tops induced some of the inserted buds to start into growth. Scion wood of various ages was used and different parts of the stock.

947. SEN, P. K., AND MALLIK, P. C. 634.441 : 581.145

The time of differentiation of the flower bud of the mango.

Indian J. agric. Sci., 1941, 11 : 74-81, bibl. 4.

The work covered three successive years and was carried out at the Research Station, Sabour, Bihar, on healthy 15-year-old Langra mangoes which had already developed the alternate bearing habit, using shoots of the first (March) flush. The shoots ceased to grow in June-July, the first flower bud differentiation was observed early in October in two poor bearing seasons and a fortnight later following the heavy crop season, and continued increasing for six weeks. The differentiation coincided with the advent of cold dry weather and is possibly brought on by the change. In the interval of time between cessation of shoot growth and the start of bud differentiation it is believed that the shoots mature and collect appropriate reserves.

948. LYNCH, S. J., AND RUEHLE, G. D. 634.441-2.19 : 546.47

Little-leaf of mangos : a zinc deficiency.

Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 167-9, bibl. 5.

Spray applications to the foliage of zinc sulphate and lime will correct little leaf in mango. A strength of 5-2½-100 is tentatively suggested.

949. MCKEE, R. K. 634.441-2.41

Experiments on the control of mango anthracnose by spraying.

Trop. Agriculture, Trin., 1940, 17 : 115-7, bibl. 6.

Good control of anthracnose of mango *Colletotrichum gloeosporioides* is obtained by spraying with 1% bordeaux mixture. Spraying schedules are discussed. Even two sprayings seem to give an improvement in length of storage life. There appears to be a beneficial carry-over effect to the next season.

950. RUEHLE, G. D. 634.441-2.41

Spraying experiments for control of mango anthracnose.

Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 155-8.

Mango anthracnose (*Colletotrichum gloeosporioides*) can be largely controlled by the application of properly timed copper fungicides such as 4-4-100 up to 6-6-100 bordeaux, 3-100 red cuprous oxide and possibly 3-100 tri-basic copper sulphate.

951. BURMA, DEPARTMENT OF AGRICULTURE. 634.58 : 658.8

Experiments in marketing. Magwe—Groundnut.

Markets Section Bull., Dep. Agric. Burma, 4, 1940, pp. 14, 2d.

A report on the establishment of the first groundnut market in Burma, at Magwe, an important groundnut assembling station on the Irrawaddy. The object was to eliminate opportunities for cheating by contracting parties. The venture was strongly supported by the cultivators in face of a last-minute boycott by buyers which nearly wrecked the scheme. The boycott was finally broken through the support of one mill, and though there are still difficulties the market can be considered as established. The report contains a vivid account of the boycott and endless negotiations connected with it.

952. WIEHE, P. O. 634.61-2.8

Le "knife cut", du cocotier. (**Knife cut disease of the coconut.**)

Rev. agric. Maurice, 1940, 19 : 101-3, bibl. 4.

This is stated to be the first record from any country of a disease of coconut plants known from its appearance as the knife cut. Horizontal gashes appear on the trunk between the internodes and gradually widen, extending some way into the trunk. The lesions secrete a brownish gum and often adventitious roots are formed above the cut. The crowns of trees so attacked are liable to snap off in strong winds or disease organisms can gain entry and yield usually diminishes. The cause of the disease is unknown but it probably starts at a spot where the growing point of the palm is still soft and shielded by the leaf stalk and so it is not discovered until the leaf falls. The unaffected side continues to grow and it is this which probably causes the wound to open. The wounds contain the fungus, *Ceratostomella paradoxa*, the cause of coconut stem bleeding disease, but for reasons which are stated it is not thought to be the causal organism in this case. Control can only be effected by constant examination of the trees. If the symptoms are discovered early the lesions can be cut out, and the affected part cauterized by heat and then tarred. The cavities should be filled with cement. A somewhat similar disease is found in sugarcane.

953. JAYARATNAM, T. J. 634.61-2.78

A study of the control of the coconut caterpillar (*Nephantis serinopa* Meyr.) in Ceylon, with special reference to its eulophid parasite, *Trichospilus pupivora* Ferr.

Trop. Agriculturist, 1941, 96 : 3-21, bibl. 6.

The history, bionomics and distribution of the host caterpillar, its parasite complex and the life history and habits of 10 parasites are briefly described and mention is made of a number of hyper-parasites. The possibilities of using the parasite *Trichospilus pupivora* as a biological control factor are discussed. This parasite is a controlling factor of the coconut caterpillar in Western Ceylon and in South India. The article is well illustrated.

954. CHERIAN, M. C., AND ANANTANARAYANAN, K. P. 634.61-2.76

The coconut palm beetle and its control.

Indian Fmg, 1941, 2 : 130-1.

The coconut beetle *Oryctes rhinoceros* is a serious pest of a variety of useful palms. The damage is caused by the adult beetles which burrow into the softer parts of the leaf sheath near the crown, causing partial defoliation and damage to the fruiting spathe. Control methods are aimed at the destruction of the beetles in the trees and of the grubs in the manure pits or decaying vegetable matter in which they spend their pre-adult existence. The beetle can be removed from infested crowns by means of a metal rod 2½ ft. long and ¾ in. thick with a barbed hook at the business end which, inserted in the hole, impales and withdraws the occupant. The holes and affected axils are then sanded to prevent further entry. The grubs are controlled by turning the manure and compost heaps, leaving them exposed to be picked off by crows. Inoculation

of the heaps with the green muscadine fungus *Metarrhizium anisopliae* is successful in Ceylon and is under trial in India. The article is usefully illustrated.

955. STURROCK, D. 634.748

Some rootstock experiments with *Malpighia*.

Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 42-3.

Of several species of *Malpighia* tested *M. suberosa* has so far proved the most satisfactory as a rootstock for *M. punicifolia* (the Barbados Cherry). It is either immune or highly resistant to nematode and shows a high degree of compatibility with *M. punicifolia*. It is very well suited by the dry, sandy and rocky soil conditions of S.E. Florida.

956. LEACH, R. 634.771-2.42

Banana leaf spot, *Mycosphaerella musicola*, the perfect stage of *Cercospora musae* Zimm.

Trop. Agriculture, Trin., 1941, 18 : 91-5, bibl. 9.

The paper describes the perfect stage of *Cercospora musae*, banana leaf spot, mentioning the way in which it was found, and discusses the possible importance of ascospore infection in the etiology of leaf spot disease of the Gros Michel banana in Jamaica.

957. WARDLAW, C. W. 634.771-2.1 + 2.4

Banana diseases. XIII. Further observations on the condition of banana plantations in the Republic of Haiti.

Trop. Agriculture, Trin., 1940, 17 : 124-7.

The diseases briefly reviewed are "plant failure",* alkali chlorosis, *Cercospora* leaf spot, Panama disease, bacterial wilt, virus heart rot and pitting and spotting diseases of fruit, also insect attack. Some additional symptoms of "plant failure" are noted; the condition is brought about by destruction of the rootlets from causes as yet unknown. The author does not view the immediate outlook for the banana industry of Haiti with optimism.

958. THOROLD, C. A. 634.771-2.48

Cultivation of bananas under shade for the control of leaf spot disease.

Trop. Agriculture, Trin., 1940, 17 : 213-4, bibl. 8.

Shade is shown to control *Cercospora* leaf spot of bananas. Interplanting with cacao to take advantage of their shade and of that provided by their shade trees is suggested. It is recognized that the scarring of fruit will be greater under shade.

959. HENRICKSEN, H. C. 634.774

Fundamentals of pineapple growing.

Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 53-6.

Among points stressed are the following :—Select slips from plants seen growing and fruiting. Do not interplant. Soil must be permeable to air. The quicker the water clears on mixing a handful of soil with water and allowing to settle the more suitable is the soil for pineapple growing. Keep soil well supplied with organic matter, partly by cover cropping. Moist soil is not objectionable provided there is good aeration. A good method of planting is in 4 rows on raised beds 6 ft. wide separated by 3 ft. wide paths. If the soil is not too rich in plant food the first application of manure may well consist of 500 lb. sulphate of ammonia, 400 lb. sulphate of potash, 100 lb. steamed bone meal and 1,000 lb. pulverized muck applied at the rate of 5½ lb. per 100 sq. ft. or 1,600 lb. per acre. Further manuring will be dictated by the condition of the plants.

960. VEEN, A. G. 635.977.8

Lamtoro en kaalhoofdigheid. (*Leucaena glauca* and baldness.)

Bergcultures, 1941, 15 : 166, reprinted from Natuurwet. Tijdschr. Ned. Ind. 1941, dl. 101, afl. 2.

The consumption of the leaves and young pods of the common shade tree *Leucaena glauca* is reputed to cause baldness in humans and animals. Collective cases were discovered which the human victims could attribute to no other cause. Tests carried out with animals produced no result but as a postscript it is added that further experiments resulted in great loss of hair by

* See *Ibidem*, 1938, 15 : 276-83 ; *H.A.*, 9 : 296.

two horses within two weeks. The research led to the discovery that *Leucaena glauca* seed contained in some quantity a new amino acid, mimosine, of which the chemical composition is still unknown and hitherto only isolated in small quantities from the stems of *Mimosa pudica*.

961. BELLO, A. C. 635.25 : 631.8
A study of fertilizers with onions grown on Lipa clay loam in pots.
Philipp. Agric., 1941, 29 : 772-90, bibl. 9.

These pot manurial experiments on Bermuda onions were carried out at the Philippine College of Agriculture. The data indicate in a general way that certain shapes of bulbs may be correlated to some extent with the fertility of the culture medium. The unfertilized controls produced oblong or rounded but never flattened or twin bulbs. Sodium nitrate produced oblong and rounded bulbs, while ammonium sulphate, which proved to be the most suitable single manure, gave largely rounded or flattened bulbs. The flattened bulbs were produced in the cultures receiving the most nitrogen. To a basal fertilizer containing per pot of 4 onions 9.1 grams of ammonium sulphate and 11.8 grams Arcadia sodium nitrate, a mixture which had proved the best for onions on Lipa clay loam, were added singly or in combination manganese, boron, zinc and copper. Of the single elements the onions receiving $ZnSO_4$ at the rate of 0.1 gram per plant, were the best, but each of the other three minor elements also increased yield. When these elements were used in any combination with each other no improvement was shown over the plant receiving them singly. The addition of these minor elements tended to produce flattened onions.

962. TOHIR, K. A. 635.34 : 551.556.1
De cultuur van kool in het regentschap Djember. (Cabbage growing in Djember, Java.)
Landbouw, 1941, 17 : 129-35.

The cabbage is grown at an altitude of about 1,300 feet and succeeds best in the dry season. The bearing of the climate and soil on the results is discussed. Cabbage seed exposed to a humid climate soon loses viability. Keeping in stoppered jars is not enough. Viability is well preserved if the seeds in bags are stored in closed wooden boxes containing a layer of charcoal. For the sake of cleanliness the bags rest on a wooden grid fitted over the charcoal. On dry days the box is opened and exposed to the sun. From time to time the charcoal is taken out and dried. The seed beds are shaded for 14 days after sowing. The several ways of doing this are described. Three weeks after sowing the plants are transplanted to the field, being set not less than 50 cm. apart in beds measuring 1 × 6 m. intersected by paths about 30 cm. wide. Recently the covering of the ground between the plants with rice straw has been found to conserve moisture and to keep down weeds. Stable and other manures are used. The plants are irrigated every 5 or 6 days. Pests and diseases are discussed. Normal yield is 8,000 kg. per hectare and the weight per plant is from 0.5 to 1 kg. More trouble is taken with the cabbage crop than with any other native cultivation.

963. BAKER, R. E. D. 635.977.8 : 632.4
Immortelle disease.
Trop. Agriculture, Trin., 1941, 18 : 96-101, bibl. 11.

An account is given of a bark disease of Immortelle cacao shade trees, *Erythrina micropteryx* and *E. glauca*, in Trinidad. The distribution, host-range and symptoms of the causal fungus, *Calostibe striispora*, are discussed. Possible control measures including the regular replanting of shade trees are suggested.

964. WIT, F. 635.974
De biologie van de vruchtvorming bij *Strophanthus gratus*. (Biology of fruit setting of *Strophanthus gratus*.) [English summary, 11 lines.]
Landbouw, 1941, 17 : 98-105, bibl. 4.

Strophanthus gratus is an ornamental climber of the *Apocynaceae*, native of tropical Africa. The seeds are used medicinally in cardiac diseases. For this reason small quantities were planted in Java, but the flowers failed to set, being self-incompatible, and specialized pollinators necessary for cross pollination being apparently not present in Java. Artificial cross-pollination produced a high fruit set.

965. JOACHIM, A. W. R., AND KANDIAH, S. 638.162
The analysis of Ceylon foodstuffs. IX-A. The composition of some Ceylon honeys. B. The nutritive value of some palmyra products.
Trop. Agriculturist, 1940, 95 : 339-43, bibl. 4.
- VINE, H. 631.425
Physical properties of soils that affect plant nutrition.
Trop. Agriculture, Trin., 1940, 17 : 106-9, bibl. 11.
- VAN BERKEL, H. 551.566.1
 Meteorologische gegevens omtrent de Oostkust van Sumatra in 1939.
 (Meteorological data regarding the East Coast of Sumatra in 1939.)
Bull. Deli Proefst. Medan, 42, 1940, pp. 53.
- BURMA, DEPARTMENT OF AGRICULTURE. 633.18 : 658.8
Rice.
Markets Section Survey, Dep. Agric. Burma, 9, 1941, pp. 112, 2s. 3d.
- POUND, F. J. 633.19
 Adlay, *Coix lachryma-jobi*. (A useful grain crop for Trinidad.)
J. Jamaica agric. Soc., 1941, 45 : 19-23, 25, being reprinted with additional information supplied by the author from *Proc. agric. Soc. Trin. Tob.*, 1940, 40 : 147-63.
- ROGERS, W. M. 633.71
Preparation of land, transplanting and after-cultivation of cigarette tobacco.
Trop. Agriculturist, 1940, 95 : 79-83.
- DE GEUS, J. G. 631.874
 Over deugden en ondeugden van het leguminosendeck. (Merits and demerits of the leguminous cover crop.)
Bergcultures, 1941, 15 : 152-8.
- TRAUB, H. P., AND ROBINSON, T. R. 632.111 : 634.1/7 : 551.566.1
Effect of recent freeze on lychee, jaboticaba and *Mimosa bracaatinga*.
Proc. Fla. St. hort. Soc. for 1940, 1940, pp. 184-7, bibl. 7.
- FERNANDO, M. 632.3/4
The incidence of plant disease in Ceylon and relation to environmental factors.
Trop. Agriculturist, 1940, 95 : 72-8, bibl. 7.
- LEACH, R. 634.771-2.48
Banana leaf spot investigations. I. The basis of control. II. The sexual spore stage of the leaf spot fungus.
J. Jamaica agric. Soc., 1940, 44 : 454-7, 499-502, 45 : 80-1.
- BAKER, R. E. D., AND OTHERS. 632.4
A review of latent infections caused by *Colletotrichum gloeosporioides* and allied fungi.
Trop. Agriculture, Trin., 1940, 17 : 128-32, bibl. 17.
- VAN DER GOOT, P. 635.659 : 632.7
 Dierlijke vijanden van djengkol en petéh. (Some insect pests of *Pithecolobium* and *Parkia*.) [English summary, 1 p.]
Med. alg. Proefst. Landb. 46, 1940, pp. 13.

STORAGE.

966. KESSLER, H., AND BIERI, F. 664.85.037
Obstlagerungsversuche unter Anwendung künstlicher Kühlung im gewöhnlichen, gewölbten Keller (sogenannte Zusatzkühlung). (Fruit storage trials using artificial cooling in ordinary arched cellars.)
 Reprint *Landw. Jb. Schweiz*, 1940, pp. 11.

Trials in Switzerland show that by the introduction into good ordinary deep cellars provided with thick insulating walls of a small refrigerating plant it is possible to maintain a temperature

of 2°-3° C. from the end of October to June and successfully store apples in them. Comparative figures show the very moderate cost of setting up and running such an installation, especially in the case of the large cellars which will hold more than 10,000 kg. of fruit.

967. LEES, P. M. 664.8.037

La ciencia del frío. (Refrigeration.) [English summary.]

Reprinted from *Rev. As. Ing. agron. Uruguay*, 1941, No. 1, pp. 6, bibl. 22.

A brief summary is given of the general principles of cold storage of food with special reference to the vegetable products of Uruguay.

968. POWELL, A. 664.85

Stacking fruit for shed storage.

N.Z. J. Agric., 1941, 62: 199.

The proper stacking of boxed fruit in store is described. The dunnage should be carefully placed as near to the ends of the fruit cases as possible to impart stability and to prevent bruising the fruit by pressure on the sides of the case. Dunnage for the floor should be at least 2 in. × 2 in. The cases should be on their sides to avoid pressure on the lid bulge. If the storage is to be over 21 days dunnage 1 in. × 1 in. should be placed on the first three cases in the stack and 2 in. × 2 in. dunnage on every 4th case, leaving 2 inches between the ends of the cases in the stack. This process is repeated as the height of the stack is increased. Walking boards should be used during stacking to prevent bruising through treading directly on the cases. Unwrapped fruit should be stored unlidded and staggered to allow a 2-in. air space between the cases. There should be a wide door at each end of the shed to assist ventilation.

969. BROWNE, F. S. 634.11-1.564

Consumer packages for apples.

47th A.R. *Quebec pomol. Fruitgr. Soc.* 1940, pp. 34-6.

Market trials are being made with 3 new packages for apples. These are the cellophane gallon bag, the half-bushel corrugated paper board box and a peck container of the same material. The cellophane gallon bags are made of M. ADT cellophane, are $6\frac{1}{2} \times 6\frac{1}{2}$ inches and are packed in a half-bushel corrugated paper board carton, waxed or unwaxed, $13\frac{1}{2} \times 9 \times 12\frac{1}{2}$. They appear to have proved successful on the market in their first season at Ottawa and Montreal. The other methods of packing will now have been tested on the Montreal market.

970. PHILLIPS, W. R. 664.85.035.1

Apple storage in cellophane bags.

47th A.R. *Quebec pomol. Fruitgr. Soc.* 1940, pp. 37-8.

The Division of Horticulture at Ottawa has conducted experiments to determine what varieties can be packed, stored and sold in moisture-proof cellophane containers. Other problems of shape, size and strength of package have also arisen. The chief problem is, of course, that of gas tolerance, and it is essential that apples should only be enclosed in the containers at the proper stage of maturity. McIntosh proves very suitable for such storage.

971. GERHARDT, F., SMITH, E., AND ENGLISH, H. 664.85.21.035.1 + 664.85.25.035.1

Effect of carbon dioxide on apricots and peaches under simulated transit conditions.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38: 243-8, bibl. 5.

The use of solid carbon dioxide in shipping J. H. Hale and Elberta peaches appears to be feasible subject to certain conditions of temperature. Apricots (Moorpark) are less tolerant of carbon dioxide and CO₂ should be used with great caution.

972. VAN DOREN, A., HOFFMAN, M. B., AND SMOCK, R. M. 664.85.75.035.1 + 664.85.23.035.1

Carbon dioxide treatment of strawberries and cherries in transit and storage.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38: 231-8, bibl. 5.

Four varieties of strawberry kept in good marketable condition for 3 to 4 days in a continuous treatment of 15% CO₂ at 50° F. On removal they could be marketed and consumed in good

condition. This treatment was better than ordinary cold storage at 32° F., producing better colour, less sweating and mould and slower ripening. Three varieties of cherry proved capable of keeping in prime condition for 3 weeks when kept in 20% CO₂ at 40° F.

973. KLAAS, H., AND WOODRUFF, S. 664.85.037 + 664.84.037

How to prepare fruits and vegetables for freezer storage and how to use them.

Circ. Ill. Coll. Agric. Ext. Serv. 510, 1940, pp. 19.

There are now some 188 towns in Illinois which possess one or more freezer storage plants for the purpose of storing home-grown produce from the neighbourhood until required for use. This circular gives directions for the proper treatment of such produce. Vegetables must be very slightly precooked or they will taste, as the authors say, more like hay than edible plants. Fruit should be covered with syrup but not precooked. Chilling should be done promptly after treatment and some stores have arrangements for precooking on the premises. The temperature of the locker is maintained at 0° F. The produce should be packed in moisture-proof and air-tight containers and the choice of these is discussed with illustrations. A flattish rectangular paper carton of pint or quart size is recommended. A number of suitable types are on the market. A cellophane bag lining is often used. Specific directions are given for treating 6 different fruits and 8 vegetables. Instructions are given for cooking and thawing when required for use. Certain precautions are necessary, but once these have been understood, there should be no spoilage. Little vitamin A is lost during freezing, the loss of B depends mainly on the amount of blanching while that of C lost is variable, depending on a number of factors which are briefly mentioned.

974. DU BOIS, C. 664.85.037 + 664.84.037

The outlook for the frozen food locker.

Proc. N. York St. hort. Soc. 86th annu. Meeting 1941, 1941, pp. 85-91.

Not only is the cold store locker in the towns becoming increasingly popular, but there is an increased urge for the establishment of frozen food lockers on the farm. The small locker in the towns is generally about 17×20×30 inches or about 6 cubic feet in size. A much larger one is advocated for farm use say of 20 cubic feet or greater capacity. This, it is estimated, would mean a capital outlay of well over £100 with running expenses covering from 100 to 150 kilowatt hours a month for a cabinet of 24 ft. cubic capacity. Emphasis is laid on the necessity for care in selecting and preparing fruits or vegetables for storage. Vegetables which are usually eaten raw are not generally suitable, but beans, carrots, etc., are very suitable.

975. ARENGO-JONES, R. W. 664.85.037 + 664.84.037

The preservation of fruits and vegetables by freezing.

Tech. Bull. Dep. Agric. Canada 12, 1937, pp. 12.

Useful notes are given on frozen pack methods and on the suitability of different varieties for the application of this method of preservation. The fruits and vegetables concerned are strawberries, raspberries, cherries, peaches, blueberries, gooseberries, asparagus, peas, various beans, sweet corn, spinach, cauliflower, brussels sprouts, broccoli, rhubarb. Directions are added on the preparation of the products for table.

976. LEE, F. A. 664.84.656.037

Objective methods for determining the maturity of peas, with special reference to the frozen product.

Tech. Bull. N.Y. St. agric. Exp. Stat. 256, 1941, pp. 17, bibl. 16.

A method for the determination of the maturity of frozen peas by means of specific gravity is described, as also the method of total solids. The method involving the use of alcohol-insoluble solids was altered so as to be used for frozen as well as canned peas. Other questions discussed are the use of the above methods on the raw vegetable and the use of the tenderometer and texturemeter for evaluating blanched peas.

977. DUNNE, T. C. 664.85.872

Wastage in export grapes. Preliminary studies with potassium metabisulphite.

J. Dep. Agric. W. Aust., 1940, 17: 439-43, bibl. 2.

Ground crystals and crystals from $\frac{1}{4}$ to $\frac{1}{2}$ inch of potassium metabisulphite mixed with the granulated cork surrounding grapes packed for export or spread at the top and the bottom of

the cases during packing controlled *Botrytis* wastage, except where only 2 g. of metabisulphite per case was used and where large crystals were placed at top and bottom. Some grinding of the metabisulphite appears to be advantageous. The maximum quantity of the crystals used per case of 30-32 lb. was 10 g. Equally good control was obtained with 5 g.

978. ANON.

664.85.31

Notes on orange storage.

Agriculture and Forestry Notes, 1940, No. 8, pp. 4-5.

Results of a 5-month storage trial with sweet oranges and tangerines are summarized. Loss of weight of oranges wrapped in tung oil paper was 39.09% as against 57.10% in unwrapped oranges. Tangerines dried up very quickly. Two months proved the limit of their storage. Oranges intended for long storage should not be picked too ripe or their loss in weight will be excessive. Sorting and washing in 5% borax before storage lengthened storage life. Wastage was slightly less in wrapped than in unwrapped fruits. Wastage varied with origin, age of tree, size of fruit and maturity of fruit. Neither the temperature nor type of storage are given.

979. LYNCH, S. J., AND STAHL, A. H.

664.85.653.037

Studies in the cold storage of avocados.

Proc. Fla. St. hort. Soc. for 1939, 1939, pp. 79-81, bibl. 5.

Studies in the 1938-9 season at Gainesville show that optimum temperatures vary with varieties. Pollock and Trapp (West Indian vars.) were successfully stored at 42° F. for 28 days. Booth 8 (Guatemalan × West Indian hybrid) stored successfully at 42° for 14 days. Waldin (West Indian var.) and Collinson (Guatemalan × West Indian cross) did not react favourably to storage at 37°, 42°, or 48°. Lula (Guatemalan × Mexican cross) and Taylor (Guatemalan var.) stored successfully at 37° for 21 days.

980. JONES, W. W., AND KUBOTA, H.

634.651 + 664.85.651.037

Some chemical and respirational changes in the papaya fruit during ripening and the effects of cold storage on these changes.

Plant Physiol., 1940, 15 : 711-7, bibl. 15.

1. The normal process of ripening in the papaya is described and the effect of cold storage on this process discussed. 2. During the ripening process a large portion of the sucrose is hydrolyzed, the color changes from green to yellow, the flesh softens, and there is a rise in carbon dioxide elimination. 3. Cold storage stops the ripening process and causes a chill effect so that on removal to room temperature the ripening process is not resumed. [Authors' summary.]

981. WARDLAW, C. W.

664.85.771.035.1

Preliminary observations on the refrigerated gas storage of bananas.

Trop. Agriculture, Trin., 1940, 17 : 103-5.

A précis of a report issued as Memoir No. 15 of the Low Temperature Research Station, Imperial College of Tropical Agriculture, Trinidad, and summarized fully in *Horticultural Abstracts* 1940, 10 : 123-7.

982. KEITH, J.

664.84.21

Potato storage. The use of sheds.

Agriculture, Lond., 1941, 47 : 228-31.

The normal method of storing potatoes in clamps is first described. The case against the clamp is that the potatoes get wet and later give trouble and that dressing outside is hampered by weather, short daylight hours and the need for protection against frost. The author who grows seed potatoes on a large scale found that sheds were very satisfactory for storage. The potatoes kept well, were always dry, dressing and delivery could continue regardless of the weather, artificial lighting resulting in a full day's work could be used and there was no anxiety about frost damage. Although at first any available shed was used, eventually sheds 100 ft. × 45 ft. were erected, and each variety kept in a shed by itself. These large sheds, which are well lighted, are also used for boxing and sprouting seed. Protection against frost is provided by temporary coke fires made in perforated oil drums. Dry rot seldom develops in undamaged potatoes and a thorough disinfection of sprouting houses and trays at the receiving end would lessen the risk for potatoes bruised in transit. Blight with potatoes grown for seed is easily controlled by spraying and finally by burning the tops with sulphuric acid when the tubers come to seed size.

The acid seems also to have some control on virus disease. Ware potatoes cannot be thus burnt. Potatoes stored for long in the sheds should have a covering of straw to prevent moisture condensing and penetrating into the heap. Majestic, if fairly ripe and earth-free, may be stored up to 5 ft., if softer, unripe or earlier up to 3 ft. The design of the sheds used is described in detail.

983. KARMARKAR, D. V., AND JOSHI, B. M.

664.84.25

Investigations on the storage of onions.

Indian J. agric. Sci., 1941, 11 : 82-94, bibl. 10.

White and red onions as grown in Bombay sprouted in storage at 52° F. after 6 weeks, at 32° F. they did not sprout for 6 months, while at 75° and 85° F. they had not sprouted after a year. In further experiments onions stored at 48°, 50°, and 60° F. sprouted earlier than those kept at higher and lower temperatures. Root formation was also related to temperature but apparently not to shoot growth. The roots were produced at temperatures of 32° F. and over but not at temperatures of 75° F. and over. Atmospheric humidity was necessary for root growth. Onions stored at 32° F. sprouted within 3 days of removal to 68° F., those stored at 90° and 95° F. remained for 10 days at 68° F. before sprouting. There was no fungal wastage during the first 8 months of storage at 90°-95° F. Onions stored at 90°-95° F. for 6 months lost 21% of weight or double that at 32° F., small onions losing weight more rapidly than large ones. Loss of weight was less severe in onions fully mature at harvest. Pungency was unaffected at all temperatures. At 32° F. there was an increase in amount of reducing sugars and in total sugars. At 90°-95° F. the percentage of total sugars was unaltered and that of reducing sugars decreased, the proportion of non-reducing sugars thus being increased. There were marked changes in chemical composition during sprouting. Rate of respiration increased during storage.

984. SAVAGE, E. F.

664.85.11

Some factors affecting the storage quality of the Cortland apple.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 282-8, bibl. 5.

GERBALDI, C.

664.85.11.035.1

La conservazione delle mele in atmosfera controllata. (Gas storage of apples.)

Riv. Frutticoltura, 1940, 4 : 185-92.

Notes of English, Belgian and Swiss work.

LEVINE, A. S., FELLERS, C. R., AND GUNNESS, C. I.

664.85.76.035.1

Carbon dioxide-oxygen and storage relationships in cranberries.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 243-8, bibl. 6.

GERBALDI, C.

664.85.11.035.1

Conservazione della frutta in anidride solforosa. (SO₂ for fruit preservation.)

Riv. Frutticoltura, 1940, 4 : 193-7.

Notes from a paper by Solaroli in *l'Agricoltore ferrarese*.

MARTINI, S.

634.3 + 634.872/3

Le specie e le varietà di agrumi ed uve da tavola, frutta secca, minore e tropicale nei mercati della Svizzera. (Types and varieties of citrus fruits, grapes, dried fruits, etc., in the Swiss market.)

Riv. Frutticoltura, 1940, 4 : 135-44.

PROCESSING AND PLANT PRODUCTS.

985. ANON.

633/635

Recent research on empire products.

Bull. imp. Inst. Lond., 1940, 38 : 424-34.

Some recent research work by members of the Nigeria Gold Coast and the Antigua Departments of Agriculture is briefly summarized. Such work as concerns this Bureau has already been reported in *Horticultural Abstracts*.

986. BASIL, H.

634.11 : 613.2

The therapeutic value of apples.

46th A.R. Quebec pomol. Fruitgr. Soc., 1939, pp. 54-9.

An account of the successful use of apples and apple products for diarrhoea and other gastrointestinal disorders at the Ste Justine Hospital, Montreal, by the Heisler-Moro method.

987. HILTON, R. J. 663.813 : 634.11
Possibilities of apple juice production in Quebec.
46th A.R. Quebec pomol. Fruitgr. Soc., 1939, pp. 11-9.
 ARENGO-JONES, R. W.
The commercial manufacture of apple juice and other apple products.
46th A.R. Quebec pomol. Fruitgr. Soc., 1939, pp. 19-24.

The authors of both these papers deal with the commercial possibilities of apple by-products with especial reference to Quebec.

The first deals with production of apples in Quebec and the amount probably available for juice production, with markets, with dietetics, with the necessity for advertising and with the suitability of different varieties. Of those tried at MacDonald College McIntosh and Golden Russet gave much the best juice followed by Northern Spy, Baldwin, Patten, Greening, Fameuse, Milwaukee and McMahon White, all of which gave fair to good quality juice.

The second author gives a brief account of the different likely by-products as follows:—*Dried apples*.—Here the fruit is peeled and cored, bleached with SO_2 , sliced or sectioned and dried so as to have a moisture content of not more than 25%. *Canned apples*.—Fruit is peeled, cored and cut into $\frac{1}{8}$ s, $\frac{1}{6}$ s or $\frac{1}{4}$ s. The pieces after soaking in salt brine are blanched and packed tightly in cans, which are filled with water, exhausted, capped and sterilized. *Apple sauce*.—Fruit is peeled, cored, cooked, crushed or pulped and sieved. It is then sweetened and canned. *Apple pie filler* is sweetened apple with the addition of starch to take up the free liquid. *Frozen apples* are peeled, cored, sliced, bleached slightly in SO_2 or salt brine, packed into containers and held at 0°F . They may alternatively be kept in SO_2 solution at $32-48^\circ \text{F}$. *Apple butter* is made of apple, boiled apple juice, sugar and spice, which is cooked, pulped and sieved. The product is of a butter consistency and has a tart and spicy apple flavour. *Apple juice*.—Three juice canneries are noted as operating in Ontario, 3 in Nova Scotia and 2 or 3 in B.C. *Cider*.—To get the best results a certain proportion of the juice must come from cider apples. Cider varieties are available at Kentville, N.S., as a source of budwood.

988. JENNY, J. 663.813
 Die wissenschaftlichen Grundlagen der Süssmoseinlagerung unter Kohlen-säuredruck. (**The scientific basis of fruit juice storage under CO_2 pressure. Fermentation problems. Part II.**) [French and German summaries.]
 Reprint. *Landw. Jb. Schweiz. 1940, pp. 739-74, bibl. 9.*

Fruit juices are nowadays kept in hermetically sealed metal tanks furnished with safety valves. It is of interest to know whether fermentation may, under certain circumstances, take place and how high the pressure induced by the CO_2 pressure may rise in case of the safety valves not functioning properly. In the present trials the problem of fermentation of juice at different temperatures and under different CO_2 pressures has been approached and in this paper the results to date are recorded.

989. CHARLEY, V. L. S., HOPKINS, D. P., AND POLLARD, A. 663.813 : 634.11
Concentrated apple juice and treacle. I. Technique of production. II. A new method to prevent gel formation. III. Utilisation of apple concentrate and treacle.

A.R. Long Ashton agric. hort. Res. Stat. 1940, 1941, pp. 97-114, bibl. 3.

The conversion of a wide variety of apple juices into concentrates is described, and the treatment for removal of pectin is discussed. Details of the methods employed to remove the volatile fraction continuously during concentration are given as well as the composition and effect of the returning of the aromatic fraction to the concentrate. The production of apple treacle has been examined in a comprehensive manner. Using a pilot plant, a two-fold evaporation was preferred, the first stage taking the juice to a gravity of 1.200, and the second to the final treacle with gravity of 1.400 or higher. In view of the extreme difficulty in obtaining pectin-decomposing enzymes an alternative method for preventing gel formation in thick treacles is desirable. It was found that a controlled neutralization of the juice raised the pH to a figure at which gel formation was impossible. By this means very concentrated treacles could be produced without the use of enzymes. For treacle production from very acid apples it is desirable to neutralize practically the whole of the acidity in the juice. Analyses of treacles are given.

Some domestic and commercial uses for apple treace are indicated, including its use as a partial substitute for sugar in jam, as a base for concentrated apple jelly, and for a number of cooking and baking purposes. [Authors' summary.]

990. CHARLEY, V. L. S., AND KIESER, M. E. 663.813 : 634.11
The extraction of residual sugars, tannins and other constituents from once-pressed apple pomace.

A.R. Long Ashton agric. hort. Res. Stat. 1940, 1941, pp. 89-96, bibl. 3.

The yields of pure juice obtained by second pressings of apple pomace are given. They vary between 4 and 17 gallons per ton of unwashed apples. Further extraction of residual, soluble, chemical constituents in the pomace can be affected by re-pressing the disintegrated pomace with the equivalent of 2 gallons of water per cloth containing 66 lb. pomace. The water releases further quantities of juice and itself extracts considerable quantities of sugar, acid, pectin and "tannin" materials from the pomace. The water extracts in many cases were fermented down alone and gave rise to ciders of soft mellow astringencies. Although the permanganate-reducing figures for special juices showed extremely large reductions on exposure of the pomace to the air (i.e. for second, third and fourth pressings), the astringency of the fermented extracts was not similarly reduced. The oxidation of the normal "tannin" to an oxidized form which does not reduce permanganate but which still contributes an astringency to cider is suggested as the cause of this phenomenon. [Authors' summary.]

991. PEDERSEN, C. S., BEATTIE, H. G., AND BEAVENS, E. A. 663.813 : 634.11 + 634.711
Results of a demonstration sale of apple-raspberry juice.

Fruit Prod. J., 1941, 20 : 227-8, 247.

A blended fruit juice was marketed in Geneva, N.Y., consisting of 75.8% apple juice, 20.3% black and purple raspberry juice and 3.9% added sugar. The blend gave a characteristic raspberry flavour with an apple background. A reduction of only 1% in the raspberry juice caused a definite loss in raspberry character. The blend of purple and black raspberries gave a product superior to that of either alone, though red raspberry could replace purple but not black. The berry juices were added to the apple juice as soon after pressing as possible to reduce oxidation to a minimum. The blend was strained, deaerated at 12-14 cm. mercury pressure, flash pasteurized at 170° F. and packed in cans lined with fruit juice enamel. A questionnaire was sent out to purchasers. The number of favourable replies was far beyond expectation, being 99%. It is thought that the blend may have a successful commercial future.

992. CHARLEY, V. L. S., AND SILLS, V. E. 634.723 : 663.813
A note on the production of black currant juice and its suitability as a source of vitamin C.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 125-7, bibl. 5.

In 1938 and 1939 fresh black currants were crushed and treated with pectin-decomposing enzyme for 48 hours, the expressed juice being filtered and treated variously. The gravities of the fresh juices were 1.042 in 1938 and 1.048 in 1939. The filtered sweetened products were filled into white, half-pint bottles, closed with crown corks and stored without protection from light or temperature changes. Examination of both series indicates the possibility of preparing black currant juices of very attractive flavour and average vitamin contents after periods of 20 and 32 months of 95 and 80 mgs./100 c.c. respectively. A daily consumption of 100 c.c. of this juice would give a normal adult sufficient vitamin C.

993. CHARLEY, V. L. S., HOPKINS, D. P., AND POLLARD, A. 663.813 : 634.22
Concentrated plum products. The production of concentrated juices, purées and powders.

A.R. Long Ashton agric. hort. Res. Stat. for 1940, 1941, pp. 115-24.

The production of concentrated juices from fresh plums and from fruit preserved in SO₂ is discussed in detail. The chief difficulties associated with expression of the juice are described and methods are given which have allowed satisfactory processing to be carried out. The liability of the plum material to violent fermentation necessitates the shortening of the period of enzyme action to remove pectin; in some cases it was impossible to concentrate to a gravity above 1.280 without gel formation. Attractive purées have been produced by steaming the

plums and passing the cooked material through a seeding machine, followed by a Gardner disintegrator. The fine purée is boiled down to about half volume, i.e. 16-20% total solids. The purées can be used as alternatives to other products which are only produced abroad. The concentrated forms of purées have been successfully reduced to fine powders by a semi-commercial Kestner spray drier. Commercial production has also been commenced and very fine powders with valuable food properties have been produced. The pectin retains its setting power in the powder and attractive jams can be made merely by the addition of sugar to the purée reconstituted to the correct strength by diluting the powder in water. [Authors' summary.]

994. TUCKER, L. R. 663.813

Fruit juice concentration by freezing and centrifuging.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 225-30.

A study of the development and pattern of ice crystal formation in sugar solutions and fruit juices made possible the development of a method for concentrating fruit juices by freezing and centrifuging that seemed practical on a small scale. The method is described. Highbush blueberry, cherry, currant, elderberry, peach, plum, red raspberry, strawberry, apple, cherry and grape juices obtained by heat extractions were concentrated and tested. The concentration did not injure quality of any of these juices. The amount of concentration that could be obtained without serious loss of soluble solids was usually limited by the viscosity of the juices. This was especially true with cooked juices. Treatment of the viscous juices, as blueberry, with a pectin-destroying enzyme reduced the viscosity enough to remove this factor of limitation to the concentrating process and permitted concentration to 45% soluble solids, about one-fifth volume. The process seems to possess commercial possibilities. [From author's summary.]

995. CRUESS, W. V. 663.813

Blended juices and syrups.

Fruit Prod. J., 1941, 20 : 164-5, 187-8.

Blended fruit juices are becoming increasingly popular and a number of palatable combinations are suggested here and the methods of processing briefly described.

996. ARAGONE, L. A. 663.813 : 634.8 : 577.16

Vitamina C en el jugo de uva congelado. (Vitamin C in frozen grape juice.)

Reprinted from *Rev. Fac. Agron. Montevideo*, 1940, No. 21, pp. 19.

In work at the Estacion Experimental del Frio, Sayago, Montevideo, it was found that vitamin C remained in grape juice frozen immediately after being pressed and kept at a temperature of from -8 to -5° C. for more than 30 days. A daily ration of 10 c.c. of the juice concerned proved an inadequate anti-scorbutic.

997. BARTHOLOMEW, E. T., AND SINCLAIR, W. B. 634.3 : 581.192

Unequal distribution of soluble solids in the pulp of citrus fruits.

Plant Physiol., 1941, 16 : 293-312, bibl. 22.

Mature Valencia and Navel oranges and grapefruit have a considerably higher concentration of total soluble solids in their stylar- than in their stem-end halves; immature fruit may have equal amounts in both halves or a higher concentration in their stem halves. Of 130 fruits tested 87% had a higher concentration in their total soluble solids in their 3 north than in their 3 south segments. Provided they were exposed the side of the tree on which the tested fruits were growing was immaterial. The sizes of segments in an orange are unequal; no direct relation was found between the size of a segment and the concentration of soluble solids which it contains. The total soluble solids content of expressed citrus juice, determined with the refractometer, appears to be a reliable index to the temperature at which such juice will freeze. The colour of the juice was not the same in all the segments of a given fruit nor always in the stem and stylar halves of a given segment.

998. JOSLYN, M. A., AND SEDKY, A. 634.3 : 581.192

The relative rates of destruction of pectin in macerates of various citrus fruits.

Plant Physiol., 1940, 15 : 675-87, bibl. 27.

The rate of decomposition of natural pectins by the naturally occurring pectic enzymes was studied in various fruits. In apple the total pectin remained relatively constant for 4 days.

before rapidly decreasing to and remaining at two-thirds of its original value. In oranges the total pectin rapidly decreased to one-third of its original value and then remained essentially constant. In oranges, grapefruit and lemon the rate of hydrolysis of the natural pectins was in that order and in all cases approached the maximum at the end of one day, decreased rapidly during the next two days and then gradually diminished. The decomposition of pectin in the fruits was accompanied by the clarification of their extracts. Decomposition of pectic substances was fastest at pH 3.5 for oranges and at 4.5 for grapefruit and lemons. At pH 2.5 decomposition was much slower than at higher ranges. [From authors' summary.]

999. CHARLEY, V. L. S., AND PICKFORD, P. T. H. 663.3

A commercial scale experiment in sugar retention in cider.

A.R. Long Ashton agric. hort. Res. Stat. 1940, 1941, pp. 81-8.

1. A series of large scale cider-making experiments were carried out in the 1939-40 season to test various methods of checking fermentation in cider and in retaining a considerable proportion of natural sweetness. 2. Straightforward centrifuging at a gravity of about 1.025-1.030 succeeded in retaining a very large proportion of the total stock of cider in a sweet condition up to the end of April—a period that would be sufficiently long to enable the sweet cider to be bottled for natural conditioning. 3. These tests were extended to include various treatments with SO_2 and despite very large losses of the preservative when added in double, full or half doses, the presence of this chemical materially aided the efficiency of the ordinary centrifuge treatment. 4. The influence of temperature on rate of fermentation is shown by an experiment on 600 gallons of juice which was fermented during the very cold spell of January. [Authors' summary.]

1000. OLLIVER, M. 577.16 : 634/635 : 581.192

The ascorbic acid content of fruits and vegetables.

Analyst, 1938, 63 : 742 : 2-18, bibl. 12.

Antiscorbutic values of fruits and vegetables.

Lancet, Aug. 17, 1940, p. 190, bibl. 3.

Some interesting particulars are given in both these papers of the author's work in the laboratories of Messrs. Chivers, Histon, Cambridge. Among points made in the first article are the following : In the case of black currants, gooseberries and strawberries the maximum vitamin C content is obtained by early picking. On any one day of picking, however, the concentration is higher in the riper fruits of strawberry and gooseberry than in the less ripe. Small, young peas are richer in the vitamin than larger, older peas. Variety as observed in Careless and Whinham gooseberries may greatly affect the vitamin C content. In the strawberries and black currants tested, variety does not seem so important.

In the second article the author gives figures of the amounts of vitamin C normally found in certain fruits and vegetables and of the effect of cooking, especially with added soda, on these figures.

1001. ADAM, W. B. 664.84.036.5 : 613.2

The effect of canning on the nutritive value of canned vegetables.

Chem. Indust., 1941, 60 : 427-9, bibl. 25.

In a paper read at the third meeting of "The Nation's Food Series" on April 9th the author said that generally the nutritive values of canned vegetables did not differ much from those of home cooked vegetables. A comprehensive series of feeding tests has shown that no nutritive constituent is missing from canned vegetables. Dr. Harris said that the pH seemed to be the critical factor in the preservation or destruction of vitamin B_1 during blanching. In neutral or alkaline solution it was rapidly oxidized, even to some degree at room temperature.

1002. OLLIVER, M. 635.1/7 : 613.2

The effect of cooking on the nutritive value of vegetables.

Chem. Indust., 1941, 60 : 345.

Speaking at the third meeting of "The Nation's Food Series", April 9th, 1941, the author demonstrated the losses, particularly of vitamin C, sustained by vegetables after storage and different cooking processes. For maximum retention of nutritive constituents, vegetables

should be as fresh as possible, the dark green outer leaves should be included, the minimum quantity of water should be used and boiling should be fairly rapid. Vegetables should not be kept hot but should be served when ready. Dr. Mapson mentioned that vitamin B losses in cooking ran approximately parallel to those of vitamin C.

1003. PYKE, M. A. 613.2 : 635.1/7
The chemical composition of vegetable foods and their place in peace-time and war-time diets.

Chem. Indust., 1941, 60 : 345.

A summary of a paper read at the third meeting of "The Nation's Food Series", April 9th, 1941, and the ensuing discussion. The major and minor constituents of the commonest types of vegetable were demonstrated. Their role is chiefly protective in that they supply vitamins and minerals. Recent work has demonstrated the high nutritive value of the protein in leaf vegetables. Drs. Kon and Mapson referred to their experiments in which the biological value of leaf protein appeared to be lower than that of a good protein such as casein. Swedes might, it was suggested, prove an important source of vitamin C. The juice might prove, especially for infants, a useful antiscorbutic in the absence of orange juice.

1004. BOOTH, V. H., AND OTHERS. 635.1/7 : 577.16
"Vegetables as food."
Nature, 1941, 147 : 711-2, bibl. 3.

Exception is taken to a statement in a recent article under the above heading (*Ibidem*, p. 513 ; *H.A.*, 11 : 444) that there is less carotene in carrots than in spinach, watercress or broccoli. Actually the carrot stands pre-eminent as a source of provitamin A and a single daily helping will supply the full requirement for vitamin A. The statement that cooked cabbage has only 17% of the vitamin C of fresh cabbage is also held to be incorrect, the more usual loss being only 40-50% and with improved methods of cooking need only be 20%.

Miss M. Olliver and Mr. W. B. Adam in a note on the same article complain that the report of views on the "devastating" effect of cooking and canning on vitamin C in vegetables was much exaggerated and that in fact cooked and canned vegetables have, during this winter, been the main source of vitamin C for the majority of people in Great Britain and if properly chosen and handled can supply the full daily vitamin requirement for the household.

1005. ROBISON, U. M. 633.491
Blackening of potato tubers on boiling.
Nature, 1941, 147 : 777-8, bibl. 2.

To explain the black coloration which appears in some potato tubers after boiling it is suggested, tentatively, that in the raw tubers the precursor of the black pigment exists in the form of ferrous iron bound in a loose complex, possibly in combination with proteins. This complex is hydrolysed on boiling and the iron is then precipitated as a colourless ferrous compound, probably the hydroxide, which is gradually oxidized to the black oxide as air penetrates to the tissues. The theory fits facts established by recent work of the author and a number of hitherto unrelated observations by other workers in the same field.

1006. S.S. AND F.M.S. DEPARTMENT OF AGRICULTURE. 664.85.774.036.5
Quarterly report on the Malayan pineapple canning industry, September-November 1940.
Malay. agric. J., 1941, 29 : 85-7.

There are 20 registered factories in Malaya including peeling sheds. None was working at full pressure. Growers claim that the present prices are uneconomic though they bear a reasonable relation to those paid at factories. At the Government Research Station experiments are being made with pineapple jam in order to utilize the expected surplus of fruit during the next season. Pectin containing pulp, in both of which pineapple is deficient, has to be added, papaya or pumpkin being suitable. Flavouring with lime juice, citric acid or mashed ginger root is an improvement. A search is being made for other products suitable for canning by those canning factories which would not otherwise be employed during the war.

1007. LEES, P. M. 664.84.25.047
 Tiene interés por cebolla desecada el mercado de Londres. (**Onion drying for the London market.**)
 Reprinted from *Rev. la Propaganda rural, Montevideo*, Feb. 1941, p. 1.

Dried onions are prepared as follows. The bulbs are trimmed and peeled by hand and then cut into very thin slices. Thick pieces dry slowly and are apt to darken. Immersion in 5% salt solution for 3-5 minutes reduces the tendency to darken during drying and in storage. The drying is done on trays in tunnel driers though kiln driers, as used for copra, might serve. The temperature must not exceed 60° C. or the pieces will darken and lose aroma and flavour. The ultimate moisture content should be from 5 to 7%. The time required is from 5 to 10 hours. Onion powder is produced by grinding in a hammer mill after drying. The shipment is made in tin-lined cases holding 2 cwt. each. An illustration is given of a drier in use in Montevideo. Part of the information is taken from *Bull. imp. Inst. Lond.*, 1940, 38 : 324.

1008. SOKOLOFF, N. P. 634.58-1.56
Mechanized husking of groundnut. [Russian.]
Proc. Lenin Acad. agric. Sci., Moscow, 1940, No. 11, pp. 38-42.

At the Pan-Soviet Scientific Research Institute for oil-yielding crops at Krasnodar, four types of machines for husking groundnuts were tested during 1937 and 1938. Husking of dry nuts gave less good results than when the nuts were moistened to contain 16 to 18% humidity. The nuts were sorted for size and freed from dirt before dehiscing. A description of the machines and results of tests are given, showing that machine AL-4 was capable of turning out 1,314 kg. nuts per hour, the optimal humidity of the unhusked material being 18%. Husking moistened nuts gave 95.79% of unbroken nuts as against 82.28 in the case of dry nuts.

1009. BRAVERMAN, J. B. S. 634.3-1.57
Review of the present position of the citrus by-products industry in Palestine and the possibilities for its expansion.
Hadar, 1941, 13 : 259-62.

The different by-products of citrus manufactured in Palestine are discussed with the object of revealing any possibilities of expansion in view of the fact that the war has brought the fruit export industry to a standstill. The following products are discussed. Canned fruit, marmalades, preserved juices including squashes, pasteurized and concentrated juices, essential oils, dried or brine-preserved peel, meal and cattle fodder, orange alcohol and the manufacture of acetone, butyl alcohol and vinegar, pectin, citric acid, naringin, which is a bitter glucoside of grapefruit, vitamin C extracts, decolorizing carbon, cellulose products and others. Even though many of these industries might prove unprofitable and some could not be undertaken without the importation of machinery, the psychological effect on the grower of seeing his fruit converted into something useful instead of rotting on the trees is of itself a consideration that should lead to some effort to utilize the crops which will otherwise be wasted. Many of these products are already manufactured in a small way in Palestine so that experience is not lacking. Some details of the industries already in production are given.

1010. ANON. 634.771-1.56
The manufacture of dried banana products.
Bull. imp. Inst. Lond., 1941, 39 : 25-9, bibl. 8.

Two types of products can be made by drying bananas, according to whether the fruit is ripe or unripe. In the ripe fruit the starch has become converted into sugar and the fruit is dried to make banana figs and banana flakes. In the unripe fruit the carbohydrates exist almost entirely as starch and in this condition the fruit is converted into banana flour. Bananas for flour are shipped in the form of chips and milled in the importing countries. It is more conveniently shipped in chip form and adulteration is not possible. Brief notes are given on the processes of manufacture of the products.

1011. LOMINADZE, G. S. 633.72-1.56
Electrofermentation of tea. [Russian.]
Soviet Subtropics, 1940, No. 8, pp. 27-8.

During 1936 to 1938 experiments were conducted at the Institute of Tea Industry in which an electric current was passed through boxes containing tea in order to accelerate the fermentation.

The results showed the superiority of this method over other processes of fermentation: the electrofermented tea was better in taste and, moreover, stronger in brew than the control tea fermented by usual methods. The duration of the fermentation process was reduced from the usual 5 or 8 hours to 3 hours.

1012. DEIJIS, W. B. 633.72 : 581.192
Over het chemisme van de fermentatie van thee III. De fermenten in thee blad.
(**Chemistry of fermentation in tea III. In the leaf.**) [English summary, 1 p.]
Arch. Theecult. Ned. Ind., 1940, 14 : 129-38, bibl. 4.
LYNCH, S. J. 634.337 : 581.192
Seasonal variation in juice and acid content of Persian limes.
Proc. Fla St. hort. Soc. for 1939, 1939, pp. 81-3.
NEW ZEALAND DEPARTMENT OF AGRICULTURE. 658.8
Copra as a pig feed.
N.Z. J. Agric., 1941, 62 : 167.

NOTES ON BOOKS AND REPORTS.

1013. JONES, O., AND JONES, T. W. 664.8.036
Canning practice and control.
Chapman & Hall, London, 1941, 2nd edit., pp. 311, numerous bibliographies,
32s.

The preservation of foodstuffs is now accepted as part of our economic life and any contribution to this subject is therefore to be welcomed. The value of the first edition of this book on canning was recognized, not only on account of the scarcity of adequate British publications on this subject, but also because of the wide range of scientific and technical points included. With the appearance of the second edition it was to be expected that the errors and omissions of the earlier work might be corrected and this anticipation is to some extent realized. In the first edition the book lacked balance on account of the greater consideration given to the scientific control as compared with the technical aspects of canning. This balance has now been improved, and the chapter dealing with the actual process of canning has been considerably extended. It is surprising, for instance, to find a new section on fruit juice canning inserted between a general discussion on cooling and a consideration of "high short" processing. The various aspects of laboratory control in canning are well presented by the authors and this book should be useful not only to chemists and bacteriologists associated with the canning industry, but to those concerned with the study of foodstuffs. The bacteriological section is especially comprehensive and the excellent photomicrographs of bacteria have been retained from the first edition. It is to be regretted, however, that no illustration is given of *Byssoschlamys fulva*, the mould most likely to cause trouble in canned fruits, although photomicrographs of ordinary food spoilage moulds are included. Chemical control does not receive such careful handling as does the bacteriological and it is disturbing to see tables for the percentage of water and protein in fruits and vegetables compiled from figures published in 1897, when values from more recent investigations are available. The new section dealing with chemical methods of estimating vitamins can only be described as unsatisfactory, since reference is mainly made to work published 5 or 6 years ago and few of the more recent methods or approved modifications are included. Whilst the non-specific iodine method of estimating vitamin C is described in detail, no mention is made of the 2 : 6 : dichlorophenolindophenol method of Harris, although this is now widely used and generally recognized as being both reliable and specific. In spite of these criticisms the new edition of this book has much to recommend it and is a useful contribution to the study of food preservation. The publishers are to be congratulated on the high standard of this wartime publication and printing, paper and binding are exceptionally good. M.O.

1014. JOHANSEN, D. A. 578.6
Plant microtechnique.
McGraw-Hill Publishing Company Ltd., London, 1940, pp. 523, bibl. 10 pp.,
31s. 6d.

All botanists, whether they are interested particularly in the pure or in the applied side of their science, must know something of the anatomy and cytology of the plants they are

studying. The publication of a new book on Plant Microtechnique may, therefore, be looked on as an event in the botanical world. Methods for the microscopic examination of plant tissues are numerous and often complex, and their application frequently leads to disappointment. New methods are continually being introduced, but the descriptions appear in diverse journals that sometimes are not readily accessible to the general botanist, so that a compendium of those methods which have proved successful is very welcome. In the preface the author says, "with but few exceptions every procedure cited has been carefully tested by the author or by students under his immediate supervision", a statement which inspires confidence. For those who wish for more information on certain points there is a list of some 250 references bearing on the subject. The book is divided into Section I, General Methods, and Section II, Special Methods. The first section describes apparatus, reagents, stains, and methods of killing, fixing and mounting preparations; it also includes chapters on Whole Mount Methods, Smear Methods, Cytological Methods and Microchemical Methods. Section II takes the plant phyla in phylogenetic order and describes the methods for the anatomical and cytological treatment of specific groups of plants. The illustrations (a frontispiece and 110 others) "have in general been selected to illustrate the results of a given technical treatment on the material concerned". It is a book that should be available to all who are interested in the microscopic examination of plants and plant tissues. It will be of particular value perhaps to those who are not full-time microscopists and so are not able to keep in touch with the more recent advances in microscopical technique. H.W.

1015. AMERICAN SOCIETY OF AGRONOMY AND NATIONAL FERTILIZER ASSOCIATION.

(Editor: HAMBIDGE, G.)

632.19 : 631.454

Hunger signs in crops.

Judd & Detweiler, Washington D.C., 1941, pp. 327, bibls., \$2.50.

The book consists of contributions from fourteen authors each of whom has practical experience of his subject. Most of them confine themselves to descriptions of symptoms associated with mineral deficiencies in water-culture and sand-culture experiments and with results obtained by treating crops in the field on the assumption that mineral deficiencies can be diagnosed by these symptoms. Opinion is divided on this question. The work is a good presentation of the case for this assumption written in language easily understood by the layman.

Two of the fourteen authors refer to diagnosis by chemical analysis of plant tissues.

The book is well printed with a wealth of illustrations, no less than 78 of which are coloured, most of the remaining 96 being half-tone blocks; and from this point of view alone it is of remarkably good value. W.A.R.

1016. THOMPSON, C. R.

634.11-1.542

Modern apple tree pruning.

Headley Bros., 109 Kingsway, London, 1941, pp. 47, 1s. 6d.

This booklet is an expansion of articles which appeared in the *Fruitgrower*, intended chiefly for commercial apple growers. The author deserves much credit for his courageous attempt to condense so complex a subject into less than 50 pages. As Mr. Bush points out in his foreword, the result may seem involved, at least to the beginner with everything to learn. Even experienced growers might be forgiven if they grudged the time needed to become familiar with the methods described. But they will find the time well repaid. The author faces not only the necessity of allowing for the many factors which govern pruning—age, variety, condition and past performance of tree, as well as the influence of local conditions—but also tries to condense his various methods to rules of thumb, such as can be applied by the often untrained help which growers are now compelled to use. The complexity arises from the fact that different rules of thumb are needed for each age, vigour, performance and (in later years) variety group. Though the author follows the usual practice in dividing his subject matter primarily into age groups, in other respects his treatment is mainly original. In his first age group *The young tree* he insists on certain considerations still too often ignored and not only by inexperienced growers. Such are, the correct spacing of branches, neither too close nor too wide; the impossibility of getting an adequate yield per acre before the trees cover a considerable proportion of the space allowed; and the fact that leader tipping makes a tree smaller and is therefore unsatisfactory as a means of restoring vigour to weak young trees. In this last instance he very sensibly recommends

deblossoming as an aid to the effects of improved cultivation and manuring. The remainder of the booklet discusses the pruning of mature trees, of aged and crowded trees, and the relation between pruning and irregular bearing. In each case the author tries to provide rules which can be given to pruners of little experience to keep them at least somewhere near the correct treatment. The booklet is made needlessly difficult to read by somewhat hasty writing. In one or two places the meaning is not clear, even after repeated reading. More than once also "pruning" is used interchangeably with "tipping". It is to be hoped that if a second edition is called for, and still more if the author carries out his promise to write a pruning manual, he will exercise greater care in his wording, so as to make the meaning unmistakably clear. These slight blemishes should not deter growers from getting and using the booklet. N.H.G.

1017. ARKANSAS.

634/635

Fifty-second Annual Report of the Arkansas Agricultural Experiment Station for the fiscal year ending June 30, 1940, being Bull. 405, pp. 45.

A special Fruit and Truck Branch of the Station exists in Hempstead County. Work is briefly noted on rootstocks for Concord, Campbell Early and other American grape varieties, fertilizers for peach trees, irrigation of vegetables, bordeaux spraying strawberries for protection against leaf spot (*Mycosphaerella fragariae*) and leaf scorch (*Diplocarpon earliana*), increased codling moth infestation.

1018. ASSAM.

633/635

Annual Report of the Department of Agriculture, Assam, for the year 1939-40, 1940, pp. 260 + 2, 5s. 5d.

The report is supplemented by appendices containing the reports of various specialists. *Citrus*.—The newly started citrus experimental station at Burnihat has a rootstock trial in progress in which local varieties and those from other provinces are undergoing trial. Those imported from Madras are establishing themselves better than those from the Punjab and Bombay. A number of other experiments recently laid down are recorded. The yellowing and dieback of citrus common in parts of Assam was investigated and seems to be a symptom of drought in high altitudes and waterlogging in low ones. *Potatoes*.—Early and late planting, Nov. 18th and Jan. 19th, gave higher yields than intermediate dates. There was no difference in yield between whole and bisected seed potatoes. Mature tubers stored better than immature. The difference in keeping quality between varieties was very marked and is being further studied. The resting period of the Shillong potato was shortened by peeling and storing in wet sawdust, by cutting and storing in wet sawdust, by greening with diffused sunlight for 5 days and storing as before. The last method was the most successful and the least trouble. The moist sawdust seems to play an important part and was more efficient than wet sand.

1019. BIHAR.

634.1/7

Report of the Agricultural Department, Bihar, April 1938-March 1939, 1941, pp. 42 + 3, As. 7.

The section dealing with fruit research briefly mentions the work in progress at the fruit research station at Sabour. The fruits and problems under investigation are mangoes and their biennial bearing, litchi—extension of the fruiting season and areas of cultivation—and papaya—the establishment of pure lines as a necessary preliminary to any useful future research. It was found that mango fruits could travel long distances without appreciable damage in ordinary baskets if properly packed. In sugar cane investigations it was established that fallowing or green manuring before planting gives large increases, 23 and 40% respectively, over the peasant custom of taking a maize crop. Mulching the cane crop conserved soil moisture and eliminated the need for cultivation but did not increase yield. The work on a number of other crops is also briefly dealt with.

1020. BRITISH COLUMBIA.

634/5

Thirty-fourth Annual Report of the Department of Agriculture B.C. for the year 1939, 1940, pp. 146.

Horticultural Branch (34-56). Figures show that production of tree fruits tends to rise. This applies also to small fruits and especially to grapes. Special notice is made of blueberry production in the Fraser Valley. This is still on a small scale, but excellent fruit from high bush

varieties is produced and this fruit, moreover, travels well. Surveys are noted on glasshouse production, bulb production and flower and seed production. In 1939 there was a considerable increase in the acreage devoted to vegetable seed production. Most of the flower seed production is for the U.K. Notes are also given of work on plant pest and disease control; demonstration work as touching lettuce varieties, codling moth control, raspberry varieties, sweet corn varieties, celery varieties, raspberry yellow rust control, orchard cover cropping, pollination, spraying for apple scab and mealy bug. *Plant Pathologist's Report* (56-61). Among subjects dealt with are weeds, stony pit of pears, and a few new diseases noted. Reports are also included from the Provincial Entomologist and Provincial Apiarist.

1021. CANADA.

634.1/7

Report of the Minister of Agriculture, Canada, for the year ended March 31, 1940, 1940, pp. 154, 50 cents.

Division of Horticulture. A new method for the manufacture of high grade apple sauce has been developed and adopted by makers. Methods have been devised whereby 90% relative humidity can be easily maintained in stores at 32° F. without any frost accumulation on the cooling coils. Work continues towards a classification of physiological apple disorders. The use of foliage symptoms for diagnosing deficiencies is gaining ground. *Exp. Stat., Kentville, N.S.* Blueberry propagation work continues. Work is in progress on dehydration of apples and on apple juice. Trial shipments of pears submitted to pure nitrogen for 4 days instead of the usual precooling prior to gas storage proved successful. The importance to storage quality of the N-K ratio in the tree was shown in McIntosh apples. *Exp. Stat. Morden, Man.* Controlled pollination experiments are helping towards fruit varieties which will stand the climatic conditions. In storing carrots, bulking roots on dry sand and covering with several layers of burlap kept damp, proved far better than dry sand, damp sand or parawax. *Exp. Stat. Rosthern, Sask.* Over 8,000 fruit seedlings of various kinds were added to those already under trial. Gem everbearing strawberry is proving outstanding in cold and drought resistance and is also of good quality. *Exp. Stat. Summerland, B.C.* Trials include the following:—irrigation tests on vegetable crops; hardy fruit trials including rootstock trials; canning technique; frozen pack methods; fruit juice manufacture. *Exp. Stat. Saanichton, B.C.* The ground for a rootstock trial is being prepared. Experiments have included:—pear, plum, cherry and strawberry pollination trials.

1022. CARNEGIE INSTITUTION.

575/577

Annual Report of the Chairman of the Division of Plant Biology, Carnegie Institution of Washington, being reprinted from Yearb. Carnegie Inst. No. 39 for 1939/40, 1940, pp. 141-78.

Reports are made of work on many subjects interesting to horticulturists. They include:—the organic nutrition of plants; use of radioactive CO₂ in photosynthesis; the state of pigments in leaves; the origin of hexenaldehyde obtained from leaves; the quantum efficiency of photosynthesis; investigations on the cambium; investigations on desert vegetation and flora; ecological investigations.

1023. CEYLON, COCONUT RESEARCH SCHEME.

634.61

Report and accounts of the Coconut Research Scheme for 1940.

Sessional Pap. Ceylon, XVI, 1941, pp. 18, 25 cents.

From reports of A. *Technological Chemist*. Samples of copra of Nos. 2 and 3 grades from 4 estates were analysed every 2 months and proved of extremely good quality. Dwarf palms may prove a cheaper source of toddy than tall palms. A study of the chemical changes occurring during germination of nuts is in progress. Novel observations of considerable general interest have been made and will shortly be published. B. *Geneticist*. C. *Soil Chemist*. Results are given of a 6 years' NPK field experiment. P failed to increase yield and depressed the manurial effect of potash. In the later years N and K both increased yield. Potash deficiency is visible in all non-potash treatments. Highest yield increases have been 8% for nitrogen and 10% for potash which, when copra prices are below Rs. 30 per candy, barely covers the cost. Coconut poonac used as fertilizer was found to increase fly-breeding very considerably unless applied in

a properly crushed condition and covered immediately after application. Laboratory investigations on available phosphoric acid studies, uptake of potash in husk and coconut water, potash content of husks and soil moisture studies are briefly mentioned. The second part of the report deals with the finances of the Scheme.

1024. CHESHUNT.

631.544

Twenty-sixth Annual Report of the Experimental and Research Station, Cheshunt, 1940, 1941, pp. 72.

The report contains amongst other matter observations on experimental results of 1940, advisory work in wartime, plant diseases, animal pests, chemical problems. Root restriction experiments in which glasshouse tomatoes grown in cardboard containers 8"×8"×8" were compared with ground plants showed no differences this season probably because of the excellent weather. The usefulness of the containers depends chiefly on their restrictive power on unduly soft growth early in the season. Manurial experiments showed the value of horse manure and base fertilizers for tomatoes; that when artificials only are used there is no difference in yield between fertilizer applied before planting or as a top dressing and that it does not pay to grow tomatoes without enriching the soil. Tomatoes treated with muriate of potash yielded slightly less (46·73 tons per acre) than tomatoes manured with sulphate of potash (50·78 tons per acre) but there was no difference in quality or leaf colour. P. H. Williams describes some interesting plant diseases on tomato, tulips, French beans and cos lettuce. H. L. White summarizes his investigations on root rot of French beans. Control might be obtained by keeping the plants from contact with the disease in their early stages. I. W. Selman deals with the effect of the tomato mosaic on the crop. The number of flowers setting fruit is reduced. A light dressing of a quick-acting nitrogenous manure with a slight increase in atmospheric humidity will assist affected plants. The wilting exhibited by plants with severe mottle streak when the vents were opened can be remedied by careful control of ventilation and damping. The amount of unmarketable blotchy fruit was increased by virus and affected significantly by the position of the truss on the plant and the location of the plant in the house. Types of fruit markings and leaf symptoms of virus infected plants are discussed. E. R. Speyer reports control experiments on red spider with sodium selenate, on the tomato moth by trapping, on eelworm with potassium iodide solution and on wireworm with dichlorethyl ether; the latter appears to be dangerous to the plants. O. Owen deals with certain chemical problems. W. H. Read has notes on the effect of creosote and petrol vapours on mushrooms; plant injury due to sodium carbonate in a nursery water supply; experiments on treatment of glasshouses to reduce their visibility from the air. The treatments when efficient as camouflage rendered the house too dark to grow food crops. D. W. Goodall and B. D. Bolas refer to further experiments on the vernalization of tomato seed. Plants chilled before germination produced a larger crop than unchilled and 20 days' treatment gave better results than 10 days. Four different temperatures of chilling differed but little in effect and 2 humidity conditions during germination hardly affected the behaviour of the plants at all. While the increase due to the total 20-day treatment amounted over the whole crop to only 11%, over the early crop period, i.e. up to 19 July, the increase due to treatment was 45%.

1025. CYPRUS.

634.1/8

Annual Report of the Director of Agriculture, Cyprus, for the year 1939, 1940, pp. 4.

At the Central Experimental Farm, Morphou, a vineyard of superior table wine and raisin grape varieties has been established to supplement the cuttings produced at Saittas. At the Deciduous and Small Fruit Station, Trikoukia, the apple variety trial in its 5th year indicated that Worcester Pearmain, Cox's Orange Pippin, Ellison's Orange and Laxton's Superb are promising dessert and Newton Wonder a promising cooking variety for Cyprus. At Saittas Viticultural Station an experimental winery, laboratory and office have been built.

1026. EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

634/5

Report on the work of the college for the year ending 30th September 1940, 1941.

The war has led to curtailment of horticultural experimental work, but it is noted that the following trials were in progress:—manurial, varietal and pruning trials of raspberries, apples

and black currants ; pest and disease control ; late cutting broccoli varieties ; beetroot manuring ; early chrysanthemum production ; vegetative propagation of lawn grasses ; manurial trials to control potato root eelworm ; the use of soil moulds in place of pots.

1027. GOLD COAST.

637.74

Report of the Department of Agriculture for the year 1939-40,
1940, pp. 6, 1s.

Swollen shoot and die-back of cacao. This "new" disease which has been spreading with some rapidity has now been found at the Central Cacao Research Station, Tafo, to be transmissible by budding and grafting and so presumably is a virus disease. The insect vector is still unknown. Soil types do not seem to influence the disease. *Cacao selection.* Progeny trials with seed from selected trees are in progress. Vegetative propagation is not so suitable for extension work and only seed can be used for distributing improved types.

1028. HAWAII.

634/5 : 551.566.1

Report of the Hawaii Agricultural Experiment Station 1940,
1941, pp. 94.

Among projects of the different departments somewhat briefly touched on here are the following : Coffee fertilizers, their effect on yield. Tests of vegetables, mainly varietal, asparagus, snap and bush beans, tomato, lettuce, celery, cauliflower, potato including variety, cultivation, fertilizers, seed storage and breaking seed dormancy with ethylene chlorhydrin. Macadamia—chlorosis, variety tests, rootstocks, nursery propagation, pollination including a full account of the mechanism in this plant, oil characteristics. Papaw—genetics of sex determination. Vapour heat treatment of fruits and vegetables particularly of papaw. Catylase activity in papaw. Methyl-bromide fumigation for export fruits and vegetables. Colchicine and indoleacetic treatment of papaw cuttings. Mango—variety tests. Vitamin assays of macadamia nuts, of native vegetables, of Hawaiian grown new potatoes. Movement of organic solutes in the sausage tree (*Kigelia africana*). Translocation of organic materials in *Cucurbita pepo*.

1029. INDIAN TEA ASSOCIATION.

633.72

Annual Report of Toklai Experimental Station 1939, 1940, pp. 33.

The Toklai method of pruning tea, i.e. pruning so as to remove dormant shoots and weak branches, was compared with severe cleaning out, i.e. Upper Assam practice, so that remaining shoots were spaced no more than 4" apart, and with the still more severe stick pruning. The only significant result was in the 2nd flush (spring growth), when Toklai pruned teas gave better quality and much higher yield. Thus severe pruning does not improve quality and may reduce yield. In plucking there was no significant price difference between superfine and fine plucking (definitions are given), but coarse and very coarse pluckings were valued considerably lower. Manurial experiments now conclusively prove that there is no loss of quality through the use of inorganic in preference to organic manures. Sulphate of ammonia gives a better tea than might have been expected from the crop. Fertility in seed production depends upon the source of the pollen and a collection of 9 clones seems necessary to get an average seed crop. Selection of pollen source resulted in a set of 36% compared with 2% by random pollination. Immature fruit fall occurs soon after fertilization and in mid-season. The causes are being investigated. There is no difference in the size of plants raised from floating or sinking seed. Floaters from a good jat, though of lower germination percentage, might well find a market. Success in the rooting of cuttings varies with the supplying tree and with the type of cutting. Budding now gives 79% success which, however, varies with the stock used. Nitrogen manuring reduces the hair on the leaf, as apparently does high relative humidity, but hair density seems to be an inherited character. Many other investigations are recorded.

1030. IOWA.

634/635

Report of Iowa Agricultural Experiment Station on Agricultural Research for the year ending June 30 1940, pp. 300.

The Horticulture Section embraces Floriculture pp. 203-7, Pomology pp. 207-20 and Vegetable Crops pp. 220-9.

Floriculture. Work is in progress on heat resistance and adaptability to commercial cut flower production of roses, chrysanthemums, peonies, bearded iris and miscellaneous annuals and perennials.

Pomology. Work on the following projects is briefly discussed. Methods of growing uniform rootstocks for apples (selection of seed). Double working and dwarfing rootstocks for apples. Effect of Hibernal, Virginia Crab, Dudley and other rootstocks on growth and yield of apples. Soil management in apple orchards. Apple breeding for size, colour, quality, season and general desirability. Pear breeding chiefly for hardiness and blight resistance. Plum breeding. Peach breeding for hardiness. Black raspberry breeding for anthracnose immunity. Strawberry varietal trials. Breeding rose stocks. Use of growth substances for cuttings of horticultural plants. Freezing preservation methods for fruit and vegetables. Gas storage of fruit and grapes.

Vegetables. Potato breeding for scab resistance. Asparagus cultivation. Effect of manuring on storage of sweet potatoes. Muskmelon fertilizer and other studies. Varietal tests of potatoes, sweet corn, tomatoes, and other vegetables. Breeding and propagation of sweet potatoes. Storage of sweet potatoes. Pumpkin improvement. Onion breeding. Other sections deal with entomological and phytopathological research.

1031. JAMAICA.

634/635

Annual Report of the Department of Science and Agriculture for the period 1st January, 1939 to 31st March, 1940, 1940, pp. 27.

Some results of investigations are reported. Coconut soils examined in 2 areas subject to west end bud rot were found to exhibit very unfavourable water relationships; similar soils in an area of heavy and all-the-year-round rainfall produced good nuts. Foliar analysis indicated that the soil affects the chemical composition of the palm foliage far more than any apparent predisposition to west end bud rot. The chemical composition of peanuts proved very susceptible to manuring. The relation between specific gravity and the starch content of bitter cassava as a possible means of purchasing the crop on a starch basis was examined. Manuring grapefruit on terra rossa soils significantly improved the composition of the fruit. A technique has been evolved which it is thought will minimize the risk of die-back in budding West Indian lime with the large-fruited, seedless Tahiti lime. Details are not given.

1032. JOHN INNES.

634/635 : 631.53

Thirty-first Annual Report of the John Innes Horticultural Institution for the year 1940, 1941, pp. 20.

Studies have been made in the Pomology Department on seedless fruit in pears, pollen tube growth in pears, induction of polyploidy by heat, fertility of blackberries, xenia in plums, times and periods of blossoming in apples and pears, parthenocarpy in cucumber, the existence of low yielding rogues in tomatoes. The work of the Genetics, Biochemistry and Cytology Departments is also outlined.

1033. MADRAS, DEPARTMENT OF AGRICULTURE.

633/635

Report on the work of the agricultural stations in the Madras Presidency for 1939-40, 1941, pp. 813.

The reports in which this Bureau is interested are those of the fruit research station at Kodur and the pomological stations and fruit stations at Coonoor, Burliar and Kallar. Kodur (pp. 711-44). Citrus rootstock trials. With a chinee orange scion the rootstocks producing the most vigorous trees were jamberi and gajanimma with kichili and acid lime next. Least growth increments were obtained with billi-kichili and pummelo stocks and with the unworked chinee seedling. Acid limes grew best on jamberi. Electro-culture experiments in which the trees were either jacketed and sparked or irrigated with sparked water were ineffective. Some citrus root studies are briefly reported. Studies in polyembryony in mangoes were continued. Polyembryonic varieties are reputed to possess poor germination but in 3 of the varieties tested this was certainly not true. Experiments with a new method of green wood side grafting for mangoes recommended by T. Tanaka in various publications (full abstract in *H.A.*, 1939, 9 : 1428) gave very encouraging results with most varieties provided the scions were over .5 cm. in diameter and terminal shoots used. Other propagation work with mangoes is discussed in

some detail. Observations are made on the growth, floral biology, mixed panicles and pollination of the mango in regard to fruit bud formation. A progress report is made of the fruit canning, candying and bottling work of the station. At Coonoor (pp. 681-97) rootstock trials with imported Malling stocks are in progress. Results are not yet available. Apples grafted on *Photinia lindleyana* united but died after a year. At Burliar (pp. 697-702) no marked difference in germination was found between cloves sown with and without the seed coat. Seeds sown with radicle pointing upwards only gave 10·6% germination against 40·3% sown with radicle downwards. At Kallar (pp. 702-10) the search for a suitable stock for the mangosteen is continued with little success, though small plants inarched on *Garcinia tinctoria* are apparently healthy after having taken 18 months to unite. Much other work at all these stations is reported. Brief notes are given on the situation and history of each establishment.

1034. MADRAS, DEPARTMENT OF AGRICULTURE. 634.3 + 634.441

Reports of subordinate Officers for 1939-40, 1940, pp. 167, Rs. 4-2-0.

Fruit Research Station, Kodur. Citrus. The most vigorous rootstocks for the chinee orange were jamberi (rough lemon) and gajanimma. Unworked chinee seedlings produced the smallest trees. For acid lime, rough lemon was the best stock. Electro-culture did not benefit the growth of acid lime seedlings. *Mango.* The extent of polyembryony and percentage of germination was determined for 9 varieties. Considerable success has been obtained in side-grafting mango stocks in nursery beds with pre-cured terminal scion shoots of 0·5 cm. diameter. Some relationship between growth and flowering in mangoes has been determined. The origin and nature of development of mixed panicles has been studied. Botanical characters of diagnostic value and a classification of varieties according to fruit characters have been worked out, incidentally revealing existing errors in nomenclature. A number of good quality fruit products have been prepared. The remaining reports deal mostly with farming matters.

1035. MALAYA (GRIST, D. H.). 633 : 31

Malayan agricultural statistics 1939.

Econ. Ser. Bull. Dep. Agric. S.S. & F.M.S. 11, 1940, tables 102, \$1.

A review of the production and trade in agricultural products in Malaya as far back as comprehensive data are available, together with authoritative information of the developments of the year under review.

1036. MALAYA (BELGRAVE, W. N. C.). 633/635

Annual Report of the Departments of Agriculture, Malaya, for 1939, 1941, pp. 8, 7d.

This report is very considerably abridged compared with its usual form and only a brief résumé is given of the agricultural conditions and research work for the year. It is noted that papers on current agricultural research in Malaya are, however, published consistently in the *Malayan Agricultural Journal*.

1037. MAURITIUS. 633.61

Tenth Annual Report of the Sugarcane Research Station for the year 1939, 1940, pp. 48, 70 cents.

Experimental work apart from sugar cane breeding and the disease resistance and other trials connected with the testing of new varieties gave the following results. Subsoiling did not increase yield, there was no beneficial effect from forking over the alternate interlines after the crop had been cut, but the earthing up which accompanied this practice definitely increased yield in an abnormally dry growing season. Phosphate and potash fertilizers increased yield but in neither case was there any difference between applications of 20 kg. or 40 kg. per arpent. The omission of potash from the fertilizer programme heavily reduced the sucrose content and juice purity of the canes. Other manurial trials are also reported, as also experiments on the time of application. Injection of salts into the leaf of sugarcane for the diagnosis or cure of deficiency diseases seems to be of extremely limited application in the case of sugar cane. Other experimental work besides the above is also reported.

1038. MAURITIUS. 633/635
Annual Report of the Department of Agriculture, Mauritius, for 1939, 1941, pp. 33, 45 cents.

Much useful work is reported in connexion with the diseases and pests of plants of economic importance to the island, particularly sugar-cane. A solar propagator was an important factor in the rooting of large numbers of breadfruit cuttings. The new tobacco research station has started its programme of research, which is outlined.

1039. NEW YORK. 634/635
Fifty-ninth Annual Report of the New York Agricultural Experiment Station, Geneva, for the fiscal year ended June 30, 1940, 1941, pp. 58.

Among projects briefly reviewed are those which concern the manufacture of fruit juices; the freezing preservation of fruits and vegetables; breeding of fruits and grapes for quality and disease and pest resistance; the use of colchicine to induce mutants; apple rootstocks; growing bilberries on waste land; production of high resin hops. Several articles have been published on the apple rootstock work including those in *Proc. Amer. Soc. hort. Sci. for 1939*, 37: 299-310; *H.A.*, 10: 867.

1040. NORTHERN NUT GROWERS ASSOCIATION. 634.51
Proceedings of the 30th Annual Meeting of the Northern Nut Growers Association, held at Rockport, Indiana, Sept. 7th-9th, 1939, pp. 109.

Short papers of particular interest include the following:—The shuck-nut ratio in black walnut varieties. The strawberry rootworm (*Paria canella*) as a nut pest. Black walnut varieties of valuable kernel production. An appreciation of the late Mr. Howard Spence and his work [with reference to the improvement of walnut material in the U.K. Includes a list of 19 references]. Walnut oil in Switzerland. The report ends with a list of 16 references to nut growing in the Northern States of the U.S.A.

1041. NYASALAND. 633/635
Nyasaland Agricultural Quarterly Journal, 1941, Vol. I, No. 1, pp. 33, Blantyre, Nyasaland.

This new journal supersedes the *Nyasaland Tea Association Journal* with an enlarged scope. It will deal with general agricultural subjects of importance to the local planting community. The subscription is 5s. per annum.

1042. QUEENSLAND. 634/5
Report of the Director of Plant Industry (Research) 1940.
 Reprinted from *A.R. Queensland Dep. Agric. Stk for the year 1939-40*, pp. 12.

W. A. T. Summerville reports for the Horticultural Section. Only the dormant application of zinc sulphate spray will afford protection from little leaf for a reasonably long period. Fertilizer experiments show the necessity for keeping up the organic matter content. Fertilizer needs of green crops are under investigation and include trace elements. Data are available on banana nutritional problems, but do not yet give a clear picture. Information on bean fertilizer trials will shortly be available. Citrus nutritional trials with trees rather than vines have given negative results. Papaw variety trials are in progress. Strawberry selection continues. The application of phosphates is probably of no use to passion fruit vines on basaltic soil.

H. K. Lewcock reports for the Physiology Section. In pineapple fertilizer trials the effect of increasing nitrogen on growth and yield has been pronounced up to an amount equal to 1,700 lb. sulphate of ammonia per acre. Small, but probably significant, responses to increased phosphoric acid have been obtained up to applications equal to 960 lb. of superphosphate per acre. Potash applications have resulted in increased size of fruit and plant up to amounts equivalent to 1,080 lb. of sulphate of potash per acre. Trials are in progress on black heart of pineapples and on methods of forcing blossoming in pineapples by means of acetylene.

J. Leeming Schofield reports for the Bureau of Tropical Agriculture at South Johnstone. Samples of pink burr, *Urena lobata*, have been sent to Canberra for fibre experiments. Work on the asexual propagation of the mango has continued. The investigations on mango and citrus have now been transferred to Kamerunga.

1043. RUBBER RESEARCH INSTITUTE OF MALAYA.

633.912

Annual Report of the Rubber Research Institute, Malaya, 1939,
1940, pp. 277, \$1.

Botanical Division. No satisfactory method for the propagation of *Hevea* by cuttings, even with the use of growth substances, has been found. The larger and better developed the budded stocks and the less their roots are pruned, the more readily do they transplant and the smaller is the effect of growth promoting substances. These substances are of some value in the case of small, severely root-pruned stumps. In stock-scion relationships the vigour of the stock sometimes, but not always, increases the vigour of the scion and the effect may become less obvious in later years. On high-budded trees high stock yield may increase scion yield but only near the union. In density of planting experiments (9th year of growth) the highest, not necessarily the most economic, yields are still being obtained from the plots with 222 trees per acre. The denser the stand the thinner the bark, but at 435 trees per acre it is tappable, i.e. just over 6 mm. in thickness and the renewal is adequate. Pot culture deficiency experiments have given results in regard to leaf symptom characteristics of considerable interest. In the data obtained from shoot-growth the order of the treatments proved to be identical with that obtained by Wallace at Long Ashton Research Station for apple trees. Useful information has been obtained of the effect on the growth of cover crops of the increase and shade from the closing of the leaf canopy of the rubber trees. Treatment of *Hevea* seed with growth substances did not increase the percentage of germination or appreciably affect the subsequent growth of seedlings. The above is only a selection from the work of the Botanical Division. The report also discusses the work of the Soils, Pathological and Chemical Divisions and the work of the Experiment Station, much of which has already been published [and abstracted.—Ed.]. Each Divisional Report is now separately indexed and the Director's review is conveniently cross-referenced. These innovations are a welcome assistance to the reader.

1044. SABOUR (SEN, P. K.).

634.1/7

Annual Report of the Fruit Research Station, Sabour, Bihar, for the year 1938-39, 1939, pp. 51.

Research work is concerned with (1) alternate bearing in mango; (2) vegetative propagation of mango stocks; (3) propagation of litchi; (4) problems of variety and sex in papaya. (1) Varietal differences were found, e.g. typically alternate bearing varieties flower only once a year and the panicles are pure without leaves interspersed, but varieties were found which flower 2-3 times a year and others with many mixed panicles. Both these latter types show a tendency to annual bearing. Maximum dehiscence of anthers is between 8 a.m. and noon; pollen is most viable in the morning; pollen collected 15 minutes after bursting is more viable than that collected earlier. Growth and development of fruit seed and embryo and seasonal and metabolic changes in relation to growth and fruit bud differentiation are studied. Complete deblossoming in an on-year considerably increased flowering in the following off-year. Deblossoming 75% and 50% gave only slight increases. (2, 3) Indolebutyric and indoleacetic acid favourably influenced callusing of mango and litchi cuttings* but rooting, except in the case of 2 out of 10 of the litchi cuttings treated with indolebutyric, had not occurred to any extent after the 60 days allowed for the experiment.* (4) Seeds of papaya both bought and saved from known individual fruits have not always come true to name. Flowers deprived of stigmas before opening can develop fruit parthenogenetically.

1045. SIERRA LEONE.

634.774-1.53

Annual Report of the Department of Agriculture for the year 1938,
1939, pp. 95.

The agricultural policy and the activities of the Department are reported. A note on the propagation of pineapples (p. 38) mentions the success of the new method of propagation whereby the pineapple stems are cut longitudinally into slices instead of transversely. The slices are treated with permanganate of potash and placed flat and uncovered on nursery beds made up of humus-enriched soil. They are then pressed firmly into the soil. The dormant eyes quickly shoot and the young plants can be transplanted with a piece of the parent stem to other beds

* Experiments also reported by the author in *Current Science*, 1939, 8: 553-4.

prior to setting out in the field. Seventeen plants per stem were raised with Queen pineapple and the shy Smooth Cayenne was induced to produce as many as eight suckers per stem.

1046. SOUTH AUSTRALIA. 634.1/8
Report of the Minister of Agriculture of South Australia for the year ended 30th June, 1940, pp. 54.

The report of the Chief Horticulturist is contained in pp. 14-20.

On the administrative side the report deals, chiefly in figures, with various aspects of fruit and vegetable export and import and with seed testing. The experimental section gives very brief notes on the investigational work in progress at the experiment stations and in many districts.

1047. ST. VINCENT. 633.689
Annual Report on the Agricultural Department, St. Vincent, 1939, 1940, pp. 13.

Yield trials were carried out of a new locally selected arrowroot, now known as the Banana variety. The variety differs from the normal by its very compact and upright growth habit and the clusters of club-shaped rhizomes produced round the base. In a favourable situation the Banana variety outyields the normal by a substantial margin (29,616 lb. per acre against 23,076 lb.). On another site and under unfavourable weather conditions at planting, the yield of Banana was considerably less than that of the normal variety chiefly on account of loss of plants which could not be replaced through shortage of material. When lifting from the ground a higher proportion of unbroken rhizomes was obtained, so that the broken bits used for replanting were not available in any quantity. The crop was therefore continued as a ratoon crop, that is the proximal end of each rhizome was broken off and at once replanted.

1048. TANGANYIKA TERRITORY. 633.73
Fifth Annual Report Coffee Research and Experiment Station, Lyamungu, Moshi, for 1938, 1940, pp. 39, 1s. 6d.

Propagation. A method is described of procuring propagating material from trees of which the branches cannot be pegged down for the production of suckers from the eyes. *Cuttings.* Scions from the selected trees are grafted on the seedling rootstocks and planted in a propagating frame. A hardwood scion of two nodes is suitable and, if all eyes are allowed to develop, the young clone is on multiple stem from the outset. After a good union has been formed the graft is planted out in the nursery, grown up on multiple stems, all primaries being removed and each stem is eventually pegged down horizontally. The eyes of the pegged down branches send up horizontal suckers suitable for material for softwood cuttings. Artificial shade only should be provided for these young clones and should be removed as soon as possible. Factors increasing successful rooting of cuttings in the propagator are—a rooting medium of 2 parts peat moss to 1 part coarse river sand, a temperature kept down to 20-25° C., a relative humidity of 90 and the maximum of light other than direct sunlight. An overhead shade of hessian 9 feet above the ground should be sufficient. Much other information on the vegetative propagation of coffee is given. *Planting.* The following method of planting has resulted in high yields in the third year with no sign of strain on the trees and another good crop to follow. Holing three months before planting, sub-soiling one foot deep, filling in one month before planting, mixing $\frac{1}{2}$ petrol tins of cattle manure compost with surface soil per hole when filling, using plants with ball of soil and planting at nursery level. Later (after the first crop, presumably) the trees received 2 oz. per tree Niciphos and some compost given after the long rains. *Age at planting.* Coffee up to 2½ years can be easily established in the long rains and maintain its relative advantage in size compared with younger coffee. Cutting back seedlings of all ages resulted in a severe check. Notes are given on mulching and manurial experiments and on pests and diseases.

1049. TEXAS. 633/635
Fifty-second Annual Report Texas Agricultural Experiment Station 1939, 1940, pp. 304.

Horticulture, which covers pp. 21 to 37, deals with work on the following among other subjects:—*Peaches.* Replacement of white-fleshed varieties by yellow-fleshed types, preferably free stone. Breeding. *Berry breeding.* Nessberries with dewberry and raspberry. *Citrus.* Tangelo's

growth in popularity. Rootstocks. Cytology of tangelo. *Dates*. Varietal trials. *Figs*. Breeding and varietal tests. *Vines*. Breeding and variety tests, rootstocks and juice production. *Plums*. Breeding. *Strawberry* breeding and variety trials. *Vegetables*. Varietal trials of egg plant and peppers, breeding of cabbages and similar crops. Manuring of onions. Pea breeding. Varietal tests of Irish and sweet potatoes. Tomato breeding and manuring. Treatment of seed with growth substances and with Semesan. The general tendency was for increased rootgrowth following the seed treatment. *Ornamentals*. Breeding and vegetative propagation. Work at the Fruit Investigations Laboratory, Montague, is concerned with grapes and their products. There is a special Sweet Potato Investigations Laboratory near Gilmer and its work is briefly reported here. Other sections of the report are devoted to Entomology, Plant Pathology, Agriculture, etc. The work of the Substations is also described. Those in which horticulture is of interest include:—*Angleton* with grapes, strawberries and figs. *Nacogdoches*—*Rubus* varieties, blackberries and dewberries, top fruit selection. *Tomato Disease Laboratory, Jacksonville*. *Weslaco*. Citrus orchard reclamation, breeding, orchard heating, rootstocks, progeny tests, ringing, diseases, pests, Papaw breeding and varietal tests. Selection of cold-resistant avocados on West Indian rootstocks. Vegetables and ornamentals. *Winter Haven*. Fruits, subtropical and temperate. Vegetables under irrigation.

1050. VINELAND.

634.1/8

Report of the Horticultural Experimental Station, Vineland, for the year ending March 31st, 1940, 1940, pp. 12.

Research projects. Cultivation trials with Duchess and Wealthy apple trees from 1929 to 1935, in which the treatments consisted of regular cultivation, regular cultivation + farmyard manure, minimum cultivation, and minimum cultivation + manure indicate that under Vineland conditions the application of manure might be substituted for cultivation in many orchards of low fertility. Manure not only increased yields but also appreciably improved soil conditions. The effect of similar cultivation treatments on storage quality in McIntosh and Spy apples has been noted and the inference drawn that both excessive manuring or cultivation are likely to affect quality adversely, the best colour and appearance coming from fruit subjected to minimum cultivation and not manured. Trials of various soil treatments for McIntosh apples indicate the soundness of lucerne as a sod mulch in orchards where the soil is of reasonable depth and also that sod mulch is preferable to continuous clean cultivation on this type of soil. The mouse problem need not be serious under sod mulch provided that guards are placed each autumn and poisoned bait put in the runways early in November.

Brief notes are given of trials on vine soil manuring and cultivation and on the application of nitrogen to green manure crops.

Cherries on mazzard and mahaleb rootstocks are found to come into bearing about the same time, though those on Mahaleb have tended at first to bear rather heavier crops. Later, trees on mazzard have begun to catch up in size those on mahaleb, which were incidentally larger when planted and originally made quicker growth. Notes are given of sweet cherry variety flowering and fruiting times. Other trials noted include fruit breeding work, quick freezing especially of peaches, strawberries and sweet cherries, vegetable breeding and variety tests.

1051. WASHINGTON.

634/5

Forty-ninth Annual Report of the Washington Agricultural Experiment Station for the fiscal year ended 30 June, 1939, 1939, pp. 101.

The important work done in agriculture and horticulture in 1938/9 by the Washington Station at Pullman and its branches is here noted in a series of brief summaries. A few of horticultural interest are noted below. *Orchard cover crops* (p. 43). Seventy different legumes and grasses on 320 experimental plots under 33-year-old apple trees, received various manurial and chemical treatments. Rye proved one of the most tolerant to toxic soil conditions produced by sprays and superior to weeds in increasing the organic material of the soil. Of 22 leguminous covers alfalfa and sweet clovers grew the best on orchard soils. *Apple stock propagation* (p. 46). The tips of a variety of rapidly growing apple twigs were etiolated by covering with insulating tape or other material and subsequently detached and set in moist shaded sandy beds and kept at

a temperature of 55-65° F. Numerous proprietary rootgrowth substances were applied before planting. None rooted, but callus growth was obtained on those treated with Hormodin. *Fruit set* (p. 47). 1,500 to 2,000 acres of Delicious and Winesap, hand pollinated, chiefly with Golden Delicious and Blackjon, showed a marked increase in fruit set. *Oil spray injury on fruit* (p. 47). Results are given of summer spraying trials with low sulphonation petroleum oils. *Bitter pit and related diseases of pome fruits* (p. 49). Results of injections of pear trees with minor elements are inconclusive. *Fruit storage and handling* (p. 54). Plums that are sweet when ripe maintained quality in storage at 32° F. better than other varieties. Plums stored at 32° F. until ripe were of lower quality than similar fruit stored at 70° F. until ripe.

1052. WASHINGTON.

633/635

Fiftieth Annual Report of the Washington Agricultural Experiment Station for the fiscal year ended June 30 1940, 1940, pp. 123.

Most of this report is of interest to horticulturists. The director notes the incidence in the last three years of a new disease of peaches, characterized by yellowing and premature fall of leaves. In addition he notes the seriousness of the pear psylla. Rye especially has proved excellent for planting as a cover crop in old orchards with toxic soils. Additional nitrates may be necessary. Fertilizer experiments show that the best times to apply nitrogen in apple orchards in the Wenatchee district are February and December. Fruit leaf ratio trials concerned Santa Rose and Vacaville plums. Fruit drop was checked in Delicious and McIntosh apple trees by spraying with growth substances, especially in trees where the drop was only just starting. Attempts with limited success were made to induce increased fruit colour by spraying with α -naphthyl isithiocyanate. Trials with sodium thiocyanate merely resulted in leaf injury. Attempts to root hardwood cuttings of Haralson, Hibernial, McIntosh and Oldenburg apples resulted in limited bud break but no roots. Raspberries and strawberries are being bred for hardiness and disease resistance. Work at the Irrigation Branch Experiment Station has included soil moisture sampling in apple orchards. Tests of response of apple trees to irrigation were started in 1931 on 10-year-old trees and have continued since. A continuous lucerne cover crop has been maintained. The soil is a sandy loam. An annual net total of 40 acre inches of water applied in 5 equal amounts at 30 days intervals has given high yields with good tree growth. The 10-year average annual yield under this treatment has been 758 packed boxes per acre. The root distribution of some 30 of the trees under treatment was tested and results are briefly noted. The roots measured had the following distribution:—55.5% in the top 3 feet of soil, 28% in the 2nd 3 ft., 11.2% in the 7th and 8th foot depths and 5.2% in the 9th and 10th foot depths. Roots were actually found as low as 16 feet below the surface, where bed rock was encountered. Other studies at the Irrigation Station concerned vegetable manuring; crop rotation; reclamation of alkali soil; methods of irrigating sugar beets; processing of fruits and vegetables by freezing including asparagus, lima beans, edible soybeans, peaches, apples and nectarines; canning of peaches, green beans, lima beans and soybean. Brief reports are also included of work at the following stations:—*Tree Fruit Branch Station, Cranberry-Blueberry Laboratory, Soil and Water Conservation Experiment Station and the U.S. Fruit and Vegetable Products Laboratory*. Work reported from the last named concerns the successful cheap production of d-galacturonic acid as a by-product of apples, apple juice production, apple sauce production, peach canning, the canning of various beans, control of quality in tomato juice, paste and catsup by special treatment of the pectin fractions.

1053. ZANZIBAR.

633/634

Annual Report of the Department of Agriculture, Zanzibar, for 1940, 1941, pp. 9, 1s.

The annual report contains notes of work on cloves [see also Campbell, H. A.], the use of SO₂ in the preparation of copra—results disappointing—artificial colouring of oranges with acetylene, spacing and manuring of pineapples.

1054.

The annual reports and similar publications listed below have also been examined:—

Rep. agric. Dep. Antigua 1939, 1940, pp. 38.

Fifty-first A.R. Arizona agric. Exp. Stat. for 1939-40, 1941, pp. 112.

- Rep. Dep. Agric. Bermuda, 1940, 1941, pp. 11.*
Administ. Rep. Dir. Agric. British Guiana for 1939, 1941, pp. 13.
Rep. operations Dep. Agric. Burma, year ended 31 Mar. 1940, 1940, pp. 275 + 37, 5s. 3d.
Rep. agric. Statistics Dep. Agric. Burma for year ending 31 March, 1940, 1940, pp. 247, 9s.
Administ. Rep. act. Dir. Agric. Ceylon for 1939, Part 4. Education, Science and Art (D), 1941, pp. 34, 50 cts.
Informe anual Centro nacional de Agricultura Costa Rica, 1939, being Bol. Centro Nac. Agric. Costa Rica 28, 1940, pp. 119.
Ninth A.R. Minist. Agric. Eire, 1939-40, 1940, Dublin, pp. 84, 3s. 6d.
Report of the Fermentation Industries for 1940, 1941, pp. 18, published by the Society of Chemical Industry and the Institute of Brewing.
A.R. Dep. Agric. Gambia for the year ending 31st May, 1940, pp. 8.
Forty-sixth A.R. Minnesota Agric. Exp. Stat. 1938-1939, 1940, pp. 100.
A.R. agric. Dep. Montserrat, Leeward Islands, for 1939, 1940, pp. 4.
A.R. Dep. Agric. Nyasaland Protectorate, 1939, 1940, pp. 15, 2s. 6d.
Fifty-seventh A.R. Ohio agric. Exp. Stat. for year ending June 30, 1938, 1939, pp. 88.
Fifty-third A.R. Pennsylvania agric. Exp. Stat. for the fiscal year ended June 30, 1940, pp. 76.
A.R. Dep. Agric. Plant Path. branch, S. Rhodesia 1940, 1941, pp. 8 (stencilled).
Rep. Dep. Agric. St. Lucia, 1939, 1940, pp. 38, 6d.
A.R. Dep. Agric. Tanganyika Territory, 1939, 1940, pp. 7, 6d.
A.R. Dep. Agric. Tanganyika Territory, 1940, 1941, pp. 8, 6d.
Rep. Sisal exp. Stat. Tanganyika for 1938, 1939, pp. 23, 6d.
A.R. Field Experiments on Sugar Cane in Trinidad for 1940. (Turner, P. E.), 1941, pp. 260.
A.R. Dep. Agric., Uganda Protectorate for the period 1 January to 30 June, 1940, 1941, pp. 8, 1s.

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